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LIGATION OF THE INFERIOR VENA CAVA FOR THE PREVENTION OF PULMONARY EMBOLISM*

A Report of Two Cases

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THROMBOSIS in the deep veins of the lower extremities has been shown to be a frequent source of postoperative pulmonary emboli. The demonstration by Homans,[1–3] Frykholm[4] and others that such thromboses usually begin in the veins of the foot or lower leg, with later extension into the femoral and iliac veins, has led to enthusiastic attempts to prevent embolic sequelae by venous ligation proximal to the thrombotic process. Because of their easy accessibility and the fact that in early cases they lie above the site of thrombosis, the superficial and common femoral veins have generally been chosen as the sites of ligation.

The results of femoral-vein ligation have been encouraging not only for the prevention of pulmonary embolism but as a means of preventing the chronic, disabling symptoms that otherwise result, in a small percentage of cases, from the development of a full-fledged phlegmasia alba dolens. In 1941, Sears[5] reported 10 cases of femoral-vein ligation with no untoward results. In 1943, Allen, Linton and Donaldson[6] reported ligations in 202 patients; in 78 cases bilateral ligation was done. The postoperative sequelae in this series were surprisingly few, edema of the legs being the most serious. The average patient wore an elastic bandage for a period of only three or four weeks before discarding it as unnecessary. It was also found that early swelling of the legs was slightly more frequent following interruption of the common femoral vein, whereas late edema was about equally frequent following ligation of the superficial or common vein.

Homans[7] has recently suggested that when a partially obstructing thrombus is found at or above the level of the common femoral vein, ligation of the common iliac vein gives greater protection against embolism than does removal of the thrombus and ligation of the common femoral vein. He points out that ligation of the common iliac vein also allows a more satisfactory collateral pathway for venous return around the point of ligation. This collateral pathway extends upward through the deep circumflex iliac and deep epigastric veins. Of more importance are the internal iliac (hypogastric) veins, whose numerous anastomoses with each other allow the blood to be shunted across the pelvis to the iliac vessels of the side opposite the ligation. In a series of 14 common iliac interruptions no postoperative edema was noted.

The advantages of common iliac vein ligation are to a certain extent outweighed by the more extensive operative procedure that is required to isolate this vessel. Homans has used an extraperitoneal approach that is satisfactory only for unilateral ligation. He states that ligation of the inferior vena cava is probably indicated in the presence of bilateral thrombosis and is certainly to be preferred to bilateral common iliac vein ligation. The experience of Allen, Linton and Donaldson[6] in regard to bilateral thrombosis is of interest in this connection. They state, "We have found thrombosis in so many supposedly normal extremities that we are inclined to feel that simultaneous routine interruption of the opposite [femoral] vein should be undertaken." If it is true that venous thrombosis is a disease that frequently affects the vessels of both lower extremities and if, in advanced cases of femoroiliac thrombosis, it is true, as it almost certainly is, that ligation above the site of thrombus formation gives added protection against embolism, ligation of the inferior vena cava seems desirable, first to interrupt the venous channel above the evident femoroiliac thrombosis, and second to prevent embolism from a simultaneous, subclinical phlebothrombosis that is probably frequently present in the veins of the opposite lower leg.

Although it seems evident that, in the great ma-

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jority of cases, pulmonary embolism arises from venous thromboses that originate in the veins of the lower leg and later progress upward to involve the pelvic veins, there are some cases in which the thrombotic process arises in the pelvic veins themselves. Rössle[8] found from post-mortem studies that the hypogastric and iliac veins were involved in the thromboembolic process without involvement of the veins of the calf in only about 10 per cent of cases. Bauer,[9, 10] however, concluded from venographic studies that almost invariably the thromboembolic process starts in the deep, large venous trunks of the lower leg.

Henderson,[11] reporting on 313 cases of fatal pulmonary embolism among surgical cases that came to autopsy, found the origin of the emboli in 189 cases to be as shown in Table 1. In some of the

TABLE 1. *Source of Emboli in 189 Fatal Cases (Henderson[11]).*

SOURCE	No.	
Iliac vein	64	
Femoral vein	55	
Pelvic veins	43	
Prostatic plexus	18	
Vena cava	13	
Hemorrhoidal veins	1	
Vaginal plexus	1	
Cervical plexus	1	
		196
Right auricle	10	
Renal vein	7	
Axillary vein	3	
Right ventricle	3	
Ovarian veins	3	
Deep epigastric vein	1	
Jugular vein	1	
Subclavian vein	1	
Azygos vein	1	
Innominate vein	1	
		31
Total		227

cases two or even three sites of thrombosis were found. It is to be noted that in this series of 227 veins involved by thrombosis, 196 (86 per cent) were direct or indirect tributaries of the lower third of the inferior vena cava.

Numerous reports of experimental rapid occlusion of the inferior vena cava by ligation have been published, beginning with the work of Lower[12] in 1669. It has been repeatedly and conclusively shown that ligation above the level of the renal veins results in death, usually with an accompanying anuria and uremia. Below the level of the renal veins experimental ligation of the inferior vena cava is compatible with life, carries a low mortality rate and is associated with only slight and transient edema of the lower extremities.

Ligation of the inferior vena cava in man has been reported with increasing frequency. Pleasants[13] in 1911, in a fairly complete review of the literature, found reports of 8 cases in which surgical ligation of the inferior cava had been performed. In all these cases ligation was done in connection with operations on the kidney. Ochsner and Debakey[14] in 1941 commented on a series of 48 cases of caval ligation, collected by Krotoski, chiefly performed for septic thrombophlebitis resulting from puerperal infection. Collins, Jones and Nelson[15, 16] in 1943 reported a series of 41 cases of pelvic thrombophlebitis proved at operation or at autopsy. Pulmonary infarction was found in 85 per cent. In 8 cases ligation of the inferior vena cava was done, with 1 death, a mortality of 13 per cent.

From the above considerations it seems evident that ligation of the inferior vena cava below the level of the renal veins, although an operation of considerable magnitude, is compatible with survival in both experimental animals and man. A consideration of the available collateral pathways for venous return around the point of ligation[7, 13] indicates that an eventual return to normal venous pressure relations should ensue. That this is true, as shown clinically by the gradual disappearance of postoperative edema, is evidenced by the end results of the cases presented below.

The indications for ligation of the inferior vena cava are not well defined. The following cases are presented to illustrate two situations in which such an operation has been followed by recovery. In each case the caval interruption probably forestalled a fatal issue by preventing massive pulmonary embolism. At the time of caval ligation both patients had suffered multiple pulmonary infarcts. From the standpoint of the peripheral venous system the indications for caval interruption were thrombosis arising in and confined to the veins of the pelvis, and iliac thrombosis arising by propagation from the vessels of the leg and associated with possible or probable thrombosis in the veins of the opposite leg.

CASE REPORTS

CASE 1. A 49-year-old, married woman was admitted to the Framingham Union Hospital on July 8, 1944, complaining of burns of the inner aspect of both thighs. The past history was significant in that 24 years previously, following the birth of the first child, the veins of the right lower leg became prominent and painful. The patient could recall no swelling of the leg, although her obstetrician told her that she had phlebitis. The post-partum course was otherwise normal. Since this episode occasional prominence of superficial veins below the right patella associated with a "drawing sensation" had been noted, although there had never been any edema of the leg or ankle.

Shortly before admission to the hospital, a pot of coffee was dropped and the patient received burns of the anteromedial aspects of both thighs just above the knees. Examination revealed a well developed, somewhat obese woman who appeared to be in good health. The general physical examination disclosed nothing of note. The heart and lungs were normal, and the blood pressure was 147/90. On the anteromedial aspect of both thighs, just above the knees, were areas of vesication from the burns, each 15 cm. in diameter. No abnormalities of the peripheral circulation were noted in either of the lower extremities. Each of the burned areas was débrided and sprayed with 1 per cent aqueous gentian violet until a firm eschar had formed.

Laboratory examination showed the urine to be acid with a specific gravity of 1.025 and to contain 30 mg. per 100 cc. of albumin. There was no sugar. The sediment showed no cells but innumerable bacteria. The red-cell count was 4,850,000 and the hemoglobin 15.5 gm. The white-cell count was 6400, with a normal differential count.

Except for a low-grade fever caused by mild infection in the burned areas, and easily controlled by removal of the gentian eschar, the first 2 weeks of hospitalization were without incident. During the 3rd week the burned areas were

treated with gauze strips saturated with boric acid ointment and held in place with firm elastic bandages. On this regimen all evidence of sepsis disappeared and rapid epithelialization from both the periphery and numerous small epithelial "islands" occurred. On the 22nd day, the patient was allowed out of bed, and during the next 4 days she was permitted progressively increasing activity.

On the 27th day, the patient first complained of pain in the right chest posteriorly. This pain was associated with a rise in temperature to 102°F. and sudden elevation of the respiratory rate to 38. Auscultation of the chest showed no evidence of consolidation, but coarse, moist rales were heard at the base of the right lung posteriorly. An x-ray film of the chest showed a small area of increased density. The legs were carefully examined. The burned areas were free of sepsis and completely epithelialized except for a few small areas, approximately 1 cm. in diameter, which were covered with healthy granulation tissue. There was no evidence of deep or superficial phlebitis in either leg. The dorsalis pedis and posterior tibial arteries showed good pulsation. The legs were warm, with no evidence of peripheral vasoconstriction; there was no dilatation of the veins or evidence of edema. Homans's sign was negative, and no tenderness was elicited over the femoral veins or the calves.

In the belief that the patient had an asymptomatic phlebothrombosis, probably arising in the veins of the lower extremities, operation was immediately performed under local anesthesia. Because the burned areas extended over the lower thirds of the thighs, areas drained by the deep femoral veins, the common femoral vein on each leg was isolated, doubly ligated and divided. Before ligation each vein was opened between traction ligatures. No evidence of clot was found, and there was a free flow of blood from both the proximal and distal segments.

Following bifemoral ligation the chest pain promptly disappeared and, within the first 24 hours, the pulse and respiratory rates fell to normal. Bicycle exercises were started immediately after operation, and on the 3rd postoperative day the patient was allowed out of bed. In spite of the improvement in her general condition, however, the temperature continued to fluctuate between 99 and 101°F. Three days after the femoral ligations the rales at the right base had disappeared. On this day the patient complained of slight pain over the lower chest anteriorly, which lasted only a few minutes and was not associated with an increase in respiratory rate. An x-ray film of the chest taken on the following day showed no change in the area of increased density previously noted at the base of the right lung.

Eight days after the bifemoral ligation the patient was awakened by the sudden onset of severe pain in the midscapular region, associated with an elevation of the pulse and respiratory rate. A third x-ray film of the chest showed no change in the area at the right base, the left lung remaining clear. An electrocardiograph showed inversion of T_3, with slight right-axis deviation. The patient appeared acutely ill, there was slight cyanosis of the lips and fingernails, and the respirations were deep and labored. She was immediately placed in an oxygen tent, with some improvement in color. Intravenous fluids were administered, and 8 hours later her condition had improved sufficiently so that ligation of the inferior vena cava was undertaken, since it seemed evident that she had suffered a major pulmonary infarction.

Ligation of the inferior vena cava was done under spinal anesthesia through a long right paramedian incision, the center of which was at the level of the umbilicus. With the patient in the Trendelenburg position, the intestine was displaced into the upper abdomen and the posterior parietal peritoneum was incised to the right of the midline over the inferior vena cava. The cava was freed from the aorta without difficulty and doubly ligated with nylon ties, at the level of the bifurcation of the aorta. The duodenum and right ureter were identified and care was taken to avoid injury to them.

During the operation the blood pressure fell to 90/60, but responded promptly to the administration of intravenous glucose solution. At the end of the operation, which required 75 minutes, the blood pressure was 130/85. The pulse reached a maximum of 100 during the operation. When the patient was transferred to bed, however, it promptly rose to 150, but during the next 2 hours fell to 130, where it remained for the following 48 hours. The continued elevation of the pulse during this period was a matter of some concern, since it was feared that, owing to the accumulating edema fluid in the legs, it might be an indication of incipient shock. The pulse, however, did not respond to the administration of intravenous fluids consisting of glucose in distilled water, whole blood and plasma. Because the respirations continued to be somewhat labored and slight cyanosis persisted, the patient was placed in an oxygen tent on the 2nd postoperative day. Shortly thereafter the pulse fell to 100. The rapid pulse was therefore believed to be due to diminished vital capacity resulting from the pulmonary infarct.

The circulation of the lower extremities was followed closely. Immediately following operation the skin of the feet, legs and thighs was mottled and cyanotic. This persisted for only a few hours. The arterial pulsations of both feet remained good. The legs were kept elevated on pillows and, at the end of 24 hours, only the slightest amount of pitting edema could be found around the ankles. This had increased slightly at the end of 48 hours. Thereafter both legs were securely bound with elastic bandages from the toes to the groins and further edema did not accumulate while the patient remained in bed.

During the first 2 postoperative days there was profuse sweating, and this, together with mild edema of the lower extremities, caused the urinary output to be low in spite of adequate amounts of intravenous fluids. At the end of this interval the blood nonprotein nitrogen had risen to 58 mg. per 100 cc. The total serum protein was 8 gm. per 100 cc. On the 3rd postoperative day the sweating became less and the urinary output increased, but the nonprotein nitrogen did not fall to normal until the 6th postoperative day.

After the first 48 hours the patient's general condition progressively improved. The wound healed by first intention. Bicycle exercises were started on the 3rd postoperative day and were continued several times daily thereafter. She was allowed out of bed on the 12th day, with the legs and thighs tightly swathed in elastic bandages. Only slight pitting edema of the lower thirds of the legs and of the ankles occurred when she became ambulatory. She was discharged from the hospital in good condition on the 18th postoperative day. Before discharge an effort was made to secure a phlebogram to demonstrate the collateral circulation around the ligated common femoral veins and around the caval ligation. These efforts were unsuccessful because the small size of the veins would not permit sufficiently rapid introduction of the dye. The small foot veins also made it impossible to secure satisfactory venous pressure readings.

Two months after the operation the patient's only complaint was of pitting edema of both lower legs. At that time enlarged veins extended from the groins upward along the lateral aspects of the abdomen and chest to the axillae. Four months after operation these veins had entirely disappeared, there was no evidence of peripheral edema, and the patient was allowed to return to light work.

Case 2. A 71-year-old man was admitted on August 17, 1944, complaining of painful swelling of the left foot of 1 week's duration. Nine months previously he had noted a draining sinus on the medial aspect of the first metatarsophalangeal joint, which had persisted for 1 week. Thereafter he remained well until 1 week before admission, when pain, tenderness and local swelling recurred. Three days later a slight purulent discharge was noted. During the 4 days preceding admission the pain, swelling and tenderness became progressively worse and he was referred to the hospital by his physician.

Thirty-five years previously the patient was told that he had heart disease. His only symptom was mild dyspnea on exertion. Fifteen years later, cholecystectomy and appendectomy were done. Otherwise the past history was noncontributory.

Physical examination revealed a well developed and well nourished man who appeared to be acutely ill. The temperature was 101.6°F., the pulse 90, and the respirations 24. The head and neck showed no abnormalities. Excursions of the chest were equal but limited on both sides. The lung fields were resonant, with vesicular breathing throughout. Scattered, fine, moist rales were heard at the bases of both lungs. The heart was slightly enlarged, the left border of dullness being 2 cm. outside the midclavicular line. A soft systolic murmur was heard at the apex. The blood pressure was 180/100. The abdomen showed a well healed scar over the right upper rectus muscle but was otherwise normal. The

prostate was small, of normal consistence and nontender. The right foot showed no abnormalities, and the arterial pulsations were normal. On the medial surface of the first metatarsophalangeal joint of the left foot was the opening of a sinus from which a small amount of thin, odorless pus drained. A smear of this material showed the presence of a staphylococcus that was later identified as *Staphylococcus albus*. From the opening of this sinus an area of cellulitis extended over the dorsum of the foot to the level of the malleoli. This area was red, hot and moderately tender. No evidence of lymphangitis was present, although inflammatory edema extended up to the knee. Arterial pulsations could not be identified, although there was a good inflammatory reaction, and the noninflamed areas were warm, indicating a satisfactory collateral circulation. No enlarged inguinal nodes were palpable.

The specific gravity of the urine varied from 1.010 to 1.022. On admission no albumin was found, but in subsequent specimens it varied from 100 to 190 mg. per 100 cc. No sugar was found in the urine in routine or premeal specimens, although the fasting blood sugar was 153 mg. per 100 cc. The urine sediment contained no cells at the time of admission, but subsequently as many as 90 to 100 white cells were found per high-power field. The red-cell count was 3,800,000, and the hemoglobin 14.5 gm. The white-cell count was 11,700 with 89 per cent neutrophils. The nonprotein nitrogen was 53 mg. per 100 cc. on admission, subsequently falling to 28 mg. The total serum protein was 7.3 gm. per 100 cc. with 5.0 gm. of albumin and 2.3 gm. of globulin, a ratio of 2.1. The whole blood chloride was 493 mg. per 100 cc., expressed as sodium chloride.

X-ray examination of the foot showed calcification in the blood vessels. There was marked decalcification of the bones, but no evidence of osteomyelitis.

Immediately after admission sulfadiazine was begun and the patient received a total of 4 gm. On the evening of the 1st day, however, he suffered a severe chill, followed by a temperature of 104.8°F. Because of the elevated nonprotein nitrogen, sulfadiazine was discontinued and penicillin was begun in doses of 20,000 Oxford units intramuscularly every 4 hours. The inflammation was treated locally with elevation and constant, wet heat. On this regimen the infection localized, and 4 days later incision and drainage was done under local anesthesia. Following drainage the temperature promptly fell to normal, where it remained for 3 days.

On the evening of the 3rd postoperative day, a sudden increase of respirations to 24 was noted and the pulse rose from 80 to 96. The patient complained of lower-abdominal pain. Examination revealed a distended bladder that on catheterization yielded 2220 cc. of urine. Until that time the patient had been voiding in large amounts and had had a satisfactory total daily output. Following catheterization the abdominal pain was relieved but the respirations remained elevated. In retrospect it seems likely that the first pulmonary embolus occurred at that time and was followed by acute urinary retention. Repeated examinations of the chest during the following 6 hours showed nothing of diagnostic importance. The legs were carefully examined and showed no tenderness of the calves or thighs. Homans's sign was negative on the right leg but could not be obtained on the left side because of the draining wound over the left ankle.

On the following day the temperature rose to 102.4°F., and during the following 4 days it fluctuated around 101°F. An x-ray film of the chest taken on the day of the first temperature rise showed the lung fields to be clear. The aorta was tortuous and showed some calcification in its arch. The left ventricle was prominent. The chest film was repeated 3 days later and again showed the lung fields to be clear.

Although a pulmonary embolus was strongly suspected and the legs were examined several times daily, it was not until the fifth day after the onset of chest symptoms that tenderness could be elicited in the left calf and over the course of the left femoral vein in the thigh. At that time slight induration was found over the course of the vein, suggesting that the femoral vein, as well as the iliac vein, was solidly thrombosed. Because of the continued fever, associated with an irregular elevation of the respiratory rate, it was believed that the patient had suffered multiple small pulmonary emboli, none of sufficient size to cause a visible change on the x-ray plate.

The patient was immediately transported to the operating room, where the left femoral vein was exposed under local anesthesia. The common femoral vein was opened between traction ligatures and found to contain an adherent thrombus that completely occluded its lumen. With a large suction tip an effort was made to remove this clot from the common femoral and external iliac veins. A rather large amount was removed, but only a trickle of blood was obtained from the proximal segment, indicating that it extended well into the common iliac vein. The common femoral vein was doubly ligated and divided and the wound closed. In the portion of the femoral vein from which the thrombus was removed it was noted that the intima was destroyed in many small areas so that tiny bits of clot remained adherent, giving it an irregular, patchy appearance. The impression was gained that, had the thrombus been completely removed and a good flow of blood obtained from the proximal segment, this patchy destruction of the intima would have allowed the clot to re-form in the part of the vein proximal to the ligation. The danger of embolism would therefore probably not have been reduced by femoral ligation.

A decision was made to ligate the inferior vena cava. Under spinal anesthesia, supplemented with intravenous Pentothal Sodium, a long right-rectus-splitting incision was made, with its center at the level of the iliac crest. The patient was placed in the Trendelenburg position and the intestine was displaced into the upper abdomen. The posterior parietal peritoneum was incised over the inferior vena cava. There was a considerable amount of fat in this region, and it was with some difficulty that the cava was isolated from the aorta. The duodenum and right ureter were visualized and carefully avoided. A No. 6 nylon ligature was passed around the vena cava at the level of the bifurcation of the aorta. Preoperatively it was intended that the cava should be opened and searched for clot, since clot extending up the inferior vena cava for a distance 12 to 15 cm. has been found,[17] but shortly before the ligature was applied the patient became restless and cyanotic and it was thought wise to terminate the operation as rapidly as possible. The cava was therefore ligated twice, in continuity, the ligatures being about 1 cm. apart, and the vessel was not opened. No change in pulse or blood pressure was noted at the time the caval lumen was obliterated. The posterior peritoneum was closed with a catgut suture, the intestines replaced, and the abdominal wall repaired. At the beginning of the operation the pulse was 94 and the blood pressure 140/80. At its termination 65 minutes later the pulse was 80 and the blood pressure 85/40.

Following operation, elastic bandages were applied to the legs and thighs, the lower extremities were elevated and the patient was placed in an oxygen tent and was given 500 cc. of plasma followed by 500 cc. of 5 per cent glucose in distilled water intravenously. Immediately following operation profuse perspiration was noted; the extremities were cold, and the patient appeared to be in mild shock. The pulse, however, remained slow, and following the intravenous plasma and glucose the blood pressure returned to 120/85. The profuse perspiration continued for 36 hours, well after other clinical signs of shock had disappeared.

Mottled cyanosis of both legs was noted immediately after operation but was not so marked as in Case 1. Pitting edema of both legs and thighs was evident 4 hours after operation. The edema became most marked 36 hours after operation, after which it gradually subsided and remained absent as long as the patient was confined to bed. As soon as he was allowed out of bed, however, the edema returned, although it became progressively less each day. At the time of discharge only slight edema of the ankles and lower legs was present after the patient had been out of bed for some hours.

For the 4 days preceding caval ligation the temperature had fluctuated between 101 and 103°F. Within 5 hours after ligation the temperature fell to normal, where it remained for the next 36 hours. Beginning on the 2nd and continuing through the 8th postoperative day, the temperature fluctuated between 99 and 101°F., thereafter returning to normal, where it remained during the rest of the hospital stay.

Use of the oxygen tent was continued through the first 36 hours after operation while the respirations were labored and rapid. Thereafter the respirations were normal in rate and excursion, and the oxygen was discontinued. The patient was then able to take food and fluids by mouth, so that intravenous medication was also discontinued.

On the 4th postoperative day, the patient was allowed to dangle his legs and the following day was allowed out of bed. In spite of rather marked weakness this activity seemed beneficial and was continued. On the 9th day, a considerable in-

crease in the amount of edema of the legs was noted. Examination of the abdomen showed a small amount of intraperitoneal fluid. Digitalization, which had been begun at the onset of the respiratory distress 5 days before operation, was continued. By the 12th postoperative day the edema and ascites had become worse and 1 cc. of Salyrgan-Theophylline was given intravenously. This was followed by diuresis and diminution of both the ascites and the edema. Because this medication was followed by a chill and fever that lasted for several hours, it was not repeated. With continued activity the ascites gradually disappeared and at the time of discharge from the hospital was entirely gone. The ascites, associated with albuminuria, raised the question whether thrombosis of the inferior vena cava was extending from the site of ligation upward to the region of the renal vessels and possibly beyond. Judging from the subsequent course of events, it is improbable that this occurred.

During hospitalization venous-pressure studies were carried out using small veins on the dorsum of the foot or ankle, simultaneous readings being taken from the right arm. All veins were at the level of the heart when the pressures were recorded. The results of these studies are shown in Table 2.

TABLE 2. *Venous-Pressure Readings.*

No. of Days After Operation	Venous Pressure		
	Right foot	Left foot	Right arm
	mm. water	*mm. water*	*mm. water*
3	380	314	78
7	330	292	82
15	300	226	62

The progressive fall in the venous pressure of the feet indicates the rate at which the collateral circulation was established around the point of caval interruption.

Three months after operation the edema of the left leg was minimal and there was no edema of the right leg. All symptoms of obstruction of the bladder neck had disappeared after a prolonged course of stilbestrol,[18] and there was no evidence of ascites. Enlarged veins were noted over the abdomen and chest, being particularly prominent over the lateral aspects.

Summary and Conclusions

Ligation of the inferior vena cava below the level of the renal veins, although an operation of some magnitude, is compatible with recovery in seriously ill patients.

Caval interruption is effective in preventing the embolic sequelae of thrombosis of the pelvic veins, whether this thrombosis is primary in the pelvic veins or secondary to a propagating thrombophlebitis originating in the veins of the legs.

Even following ligation of the common femoral veins, an adequate collateral circulation develops around the obstructed cava and peripheral edema eventually disappears.

The indications for ligation of the inferior vena cava are briefly discussed.

Two cases are presented in which caval interruption effectively prevented further pulmonary infarction. The operation was followed by complete recovery in each case.

The postoperative course in these cases is presented in some detail. The following points were most helpful in sustaining the patient through the critical postoperative period: swathing the feet, legs and thighs tightly in elastic bandages to help prevent shock due to the rapid withdrawal of edema fluid from the circulation; the early use of oxygen; and adequate intravenous infusions of plasma and whole blood.

References

1. Homans, J. Thrombosis of deep veins of lower leg causing pulmonary embolism. *New Eng. J. Med.* **211**:993-997, 1934.
2. *Idem.* Venous thrombosis in lower limbs: its relation to pulmonary embolism. *Am. J. Surg.* **38**:316-326, 1937.
3. *Idem.* Exploration and division of femoral and iliac veins in treatment of thrombophlebitis of leg. *New Eng. J. Med.* **224**:179-186, 1941.
4. Frykholm, R. Pathogenesis and mechanical prophylaxis of venous thrombosis. *Surg., Gynec. & Obst.* **71**:307-312, 1940.
5. Sears, J. B. Experience with femoral-vein ligation for prophylaxis of postoperative pulmonary embolism. *New Eng. J. Med.* **224**: 108-110, 1941.
6. Allen, A. W., Linton, R. R., and Donaldson, G. A. Thrombosis and embolism; review of 202 patients treated by femoral vein interruption. *Ann. Surg.* **118**:728-740, 1943.
7. Homans, J. Deep quiet venous thrombosis in lower limb; preferred levels for interruption of veins; iliac sector or ligation. *Surg., Gynec. & Obst.* **79**:70-82, 1944.
8. Rössle, R. Über die Bedeutung und die Entstehung der Wadenvenenthrombosen. *Virchows Arch. f. path. Anat.* **300**:180-189, 1937.
9. Bauer, G. Venographic study of thrombo-embolic problems. *Acta Chir. Scandinav.* Supp. **61**:75, 1940.
10. *Idem.* Venous thrombosis: early diagnosis with aid of phlebography and abortive treatment with heparin. *Arch. Surg.* **43**:462-472, 1941.
11. Henderson, E. F. Fatal pulmonary embolism; statistical review. *Arch. Surg.* **15**:231-236, 1927.
12. Lower, R. Tractus de corde, 1669. Cited by Pleasants.[13]
13. Pleasants, J. H. Obstruction of inferior vena cava with report of eighteen cases. *Johns Hopkins Hosp. Rep.* **16**:363-548, 1911.
14. Ochsner, A., and Debakey, M. Therapeutic considerations of thrombophlebitis and phlebothrombosis. *New Eng. J. Med.* **225**:207-227, 1941.
15. Collins, C. G., Jones, J. R., and Nelson, E. W. Surgical treatment of pelvic thrombophlebitis; ligation of inferior vena cava and ovarian veins; preliminary report. *New Orleans M. & S. J.* **95**: 324-329, 1943.
16. Nelson, E. W., Jones, J. R., and Collins, C. G. Pelvic thrombophlebitis; study of the etiologic factors from statistical standpoint. *New Orleans M. & S. J.* **95**:375-381, 1943.
17. Walters, C. W. Personal communication.
18. Klein, W., and Newman, B. Oral administration of diethylstilbestrol for prostatism: clinical evaluation. *Arch. Surg.* **48**:381-387, 1944.

THE HAZARD OF TRANSFUSION MALARIA AFTER THE WAR

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ACCIDENTAL malaria subsequent to blood transfusion has not been a frequent occurrence in nonendemic areas. Since 1929 only 12 such cases have been reported to the Massachusetts Department of Public Health. In some other parts of the globe this route of transmission is more frequent. In Peiping, China, for example, Wang and Lee[1] reported 54 cases of malaria complicating 3700 transfusions over a period of ten years. Thoroughman,[2] working in Kiangsu, China, where malaria is encountered throughout the year, reported 45 cases of malaria after the administration of whole blood to 104 patients. In such endemic areas it is practically impossible to exclude mosquito transmission in cases occurring after transfusion. Furthermore, consideration must be given in these localities to the possibility of a previously unrecognized latent infection as the cause of manifest malaria after a transfusion.

In nonindigenous areas where insect-borne malaria is exceedingly rare, difficulties of this sort are not encountered in the diagnosis of post-transfusion malaria. In Massachusetts, since 1930, the possibility of insect transmission within the Commonwealth was present in only 11 reported cases of malaria.[3] Since 1938, not a single naturally acquired infection has originated in Massachusetts, but from 1939 to 1944 half the 12 post-transfusion cases were reported. This suggests that during the last six years the risk of acquiring malaria in Massachusetts by a blood transfusion has been greater than that by the natural route of infection. It is therefore apparent that observations in Massachusetts concerning accidental transmission as the result of transfusion are highly reliable.

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It is extremely likely that unless certain precautions are observed the situation after the war with reference to the paucity of malarial cases following transfusion will be considerably altered. In the first place, familiarity with the technic of administering whole blood as well as some of its derivatives has been acquired by large numbers of physicians serving with the armed forces. Furthermore, the available supply of whole blood in civilian hospital banks has increased tremendously during the war emergency.

At the conclusion of the war, large numbers of men will return to this country from regions in which malaria is endemic. A certain proportion of these persons will continue to harbor malarial parasites in the blood as the result of either clinical or subclinical infection. Although an increase of insect-borne malaria is not anticipated in this climate following the return of these men,[3] it is conceivable that if such discharged veterans are used indiscriminately as whole-blood donors an increased incidence of post-transfusion malaria will be the result.

To re-emphasize the hazard of acquiring malaria as a result of either the intravenous or the intramuscular administration of whole blood, this paper will review the Massachusetts cases infected in this manner. In addition, the clinical and epidemiologic data concerning 2 of the more recent cases will be presented in detail.

Table 1. *Post-Transfusion Malaria in Massachusetts (1929–1944).*

Case No.	Age	Sex	Type of Malaria	Incubation Period	Donor	
					Endemic country of residence	Known duration of latency
				days		*yr.*
1	21	F	Quartan	89	Rumania	—
2	27	F	Quartan	46	Italy*	—
3	30	F	Quartan	49	—	—
4	4	F	Quartan	42	Italy	12
5	23	F	Quartan	—	—	—
6	49	M	Quartan	26	Greece	27
7	7	M	Quartan	21	Palestine†	—
8	3	M	Quartan	111	Albania	25
9	61	M	Quartan	31	Panama	20
10	41	F	Tertian	10	China‡	—
11	51	M	Tertian	21	Italy	—
12	4 months	F	Not stated	?	Greece	15

*History of malaria 10 years previously.
†History of malaria 18 years previously.
‡History of malaria 5 years previously.

Summary of Cases

The organisms identified in the blood smears of the 12 recipients were reported as follows: *Plasmodium malariae*, 9; *P. vivax*, 2; and type not stated, 1 (Table 1). The predominance of the quartan variety was striking. The clinical charts of all the cases except one demonstrated regularly recurring paroxysms every seventy-two hours. In Case 12,

that of a four-month-old child who developed malaria after several intramuscular injections of whole blood, the temperature rose every third day, with a low-grade fever intervening. It is well known that in infants and very young children the paroxysms may not be so clearly defined as they are in adults. Although the specific variety of plasmodium was not determined in this case, the long period of latency in the donor suggests that this, too, was quartan malaria.

The interval between the transfusion and the onset of symptoms in the recipient varied from ten days in Case 10 (tertian malaria) to one hundred and eleven days in Case 8 (quartan malaria). In the only other case of tertian malaria the incubation period was twenty-one days. Of the 8 quartan cases in which the incubation period could be determined, in 5 at least forty-two days elapsed before the first evidence of infection in the recipient. The patient in Case 5 received a series of transfusions for a period of several weeks before coming down with malaria; for this reason the incubation period could not be established.

The ages of the recipients varied from four months to sixty-one years. Seven patients were females, and 5 were males.

The ability of transfused blood to produce malaria is an indication of latency of infection in the donor. The total duration of latency is often difficult to establish. If the donor continues to reside in an endemic area subsequent to clinical malaria, the possibility of reinfection at a later date cannot be ruled out. Whether or not the donor presents a past history of malaria while living in an indigenous region, the duration of residence in a new country where insect transmission does not exist or is exceedingly rare may be regarded as the known period of latency. According to such a criterion, the known period of latency was established in 5 donors and varied from twelve to twenty-seven years (Table 1). Not one of these donors had a past history of manifest malaria.

Three additional donors presented a past history of malaria — one five years before infecting the recipient, the second ten years, and the third eighteen years. Because the duration and actual place of residence in the United States after being in an endemic region was not determined for these cases, the known period of latency could not be stated.

Of the 12 donors involved in this study, 10 had lived for a period of years in a country where malaria is known to be endemic (Table 1) — 3 in Italy, 2 in Greece and 1 each in Albania, China, Palestine, Panama and Roumania. In the other 2 cases, information concerning the donor's country of residence was not available.

Attempts to demonstrate malarial parasites in blood smears of the donor were made in 7 cases but were successful in only 2 (Cases 7 and 12). In most of these, both thick and thin smears were examined. In 3 cases efforts to identify the plasmodium were unsuccessful in spite of splenic massage and the administration of adrenalin.

Case Reports

Case 1. M. E., a 61-year-old native-born man, was admitted to the hospital on December 12, 1944, complaining of chills and fever of 3 weeks' duration. On October 16, a large tumor (cavernous hemangioma) had been removed from his back at another hospital. During the course of the operation and shortly thereafter the patient received several transfusions. He left the hospital on October 25. On October 30 he was readmitted because of sepsis in the operative wound. Healing occurred after incision, drainage and treatment with penicillin. He was discharged on November 14. On November 22 he began having daily chills, followed by sweats, usually late in the afternoon or evening. During the attacks he complained of severe headache.

The temperature on admission was 98.9° F., the pulse 72, and the respirations 18. Physical examination revealed a well-healed scar on the back where the tumor had been removed. There were no other unusual findings.

On December 13 the red-cell count was 4,240,000 and the hemoglobin, 81 per cent. The white-cell count was 5900, with 56 per cent neutrophils and 44 per cent lymphocytes. A blood culture on December 14 was negative, and a series of blood smears on December 13 and December 14 were positive for *P. malariae*. This was confirmed by the State Diagnostic Laboratory. X-ray examination of the chest showed evidence of chronic bronchitis in both lungs. Urinalysis was negative.

At least one paroxysm occurred each day, usually in the evening, from the day of admission until December 16. Antimalarial therapy with 1½ gr. of atabrine three times daily was instituted on December 14. On December 16, 5 gr. of quinine sulfate was also given the patient receiving this combination of drugs three times daily for the rest of the hospital stay. The temperature during the paroxysms varied from 100 to 101.4°F. Following treatment with quinine and atabrine the paroxysms disappeared. The temperature was 100°F. on the morning of December 16, and except for a slight rise to 99.6°F. in the evening of December 17 was normal thereafter. Antimalarial therapy was continued for an additional 4 weeks. Convalescence was uneventful, and the patient was discharged on December 20.

During the initial admission for the operation the patient received six transfusions, of which four were whole blood and two were plasma. It was determined that the donor for the transfusion given on October 20 had had an illness of 3 or 4 weeks' duration while living in Panama 20 years previously. The outstanding feature of this illness comprised recurrent paroxysms of chills and sweats. Physical examination of this donor revealed a palpable spleen. Thin and thick blood smears were examined after the injection of 1 cc. of adrenalin. Malarial parasites could not be found. Residence in an endemic country was denied by each of the other donors.

No cases of malaria had been reported from the recipient's community of residence for 13 years.

Case 2. J. K., a 3-year-old, native-born boy, visited his physician on October 17, 1944, with complaints of recurrent paroxysms of fever, chills and sweats every 72 hours for the last 6 weeks. About September 1, his mother noticed that he was not quite well. He was less active than usual and on one or two occasions was feverish. This was followed by the onset of regularly recurring paroxysms of chills and sweats every 3rd day.

The temperature, pulse and respirations were normal at the time of the initial examination. Physical examination revealed a pale, somewhat listless boy. The spleen was felt 3 fingerbreadths below the left costal margin. There were no other abnormal findings.

The patient's mother informed the attending physician that she expected the child to have a chill at 2 p.m. on the afternoon of October 19. One half-hour before this time the doctor visited the patient at his home. At the prophesied time a paroxysm occurred. Blood smears were taken immediately before the chill and shortly afterward. These were reported positive for *P. malariae* by the State Diagnostic Laboratory. Antimalarial therapy, consisting of quinine

sulfate, was instituted immediately. The paroxysm that was expected on October 22 did not occur. Antimalarial treatment was continued for a period of 5 weeks, during which time there were no recurrences. The spleen gradually diminished in size and was no longer palpable at an examination 2 months after the onset of treatment.

Careful inquiry into the history of this patient revealed that he had received a transfusion of 300 cc. of blood from his father on May 12 because of a severe infection of the throat. The father presented no history of malaria. He was born in Albania in 1899 and came to this country in December, 1919. During his 25 years' residence here he had been perfectly well. Thick and thin smears of the donor's blood were negative for *P. malariae*. Adrenalin was not administered.

Malaria had not been reported from the community where this case had occurred for nineteen years.

Discussion

Although quartan malaria in most parts of the world occurs less frequently than either the tertian or estivoautumnal varieties,[4] it is noteworthy that in this series of 12 cases of post-transfusion infection at least 9 and possibly 10 were caused by *P. malariae*. It is known that the period of latency in tertian infections may endure for about five years and that a single falciparum infection may remain latent for one month to a year.[4] Evidence of the sort presented in this paper indicates that latency in quartan malaria is of much greater duration.

When the war is over, the majority of malaria carriers returning from endemic areas will harbor *P. vivax*. If such persons are used as whole-blood donors within five years of their return, an increase in post-transfusion malaria of the tertian variety may occur. If large numbers of troops remain indefinitely in endemic areas, the potential supply of tertian carriers who return to this country will remain at a high level for a long time after the war. A rise in tertian cases as a result of accidental transmission may become a serious problem for a period of several years.

This possible increase in incidence in the post-war period may be prevented by rejecting all prospective donors for whole-blood transfusion who have served in endemic malarious regions. Prophylactic administration of quinine or atabrine while in the endemic area or the absence of a history of malaria should not alter this rule. Obviously, when blood is being drawn for plasma this precaution is not essential.

Ackermann and Filatov[5] and Antschelewitsch[6] have shown that when blood is stored for a long time plasmodia gradually degenerate and finally disappear. The former investigators, working with psychotic patients, were unable to transmit malaria with whole blood stored in the refrigerator for five days or longer. Antschelewitsch was able to infect persons with whole blood stored for eight days. One of our cases (Case 5) occurred after a series of stored-blood transfusions.

The long interval between the transfusion and the onset of symptoms observed in several of these cases deserves further comment. Although the incubation period in malaria varies in naturally acquired infections from six to forty days, longer periods have occasionally been reported. In Holland it has been observed that outbreaks each spring are due to infections contracted during the previous autumn.[7] Schuffner and Schwellengrebel (quoted by Hackett[4]) allowed themselves to be bitten by infected mosquitoes in the fall and had their onset eight or nine months later. It may be postulated that the prolonged incubation period noted in several of our patients was due to the relatively small number of parasites in the circulating blood after a long period of latency.

Because several weeks may elapse between the transfusion and the onset of malaria in the recipient, the causal relations of these events may not be recognized. Stein[8] reported a case in which such an association was not realized after the transfusion of a girl with blood from her father. The patient recovered after treatment with quinine. Following a second transfusion from the same donor, she again became ill with malaria. At that time it was discovered that the father had had malaria eight years previously, and parasites were demonstrated in his blood after the second transfusion.

Post-transfusion malaria when recognized and promptly treated is not usually fatal. It is an infection that may be prevented by properly selecting donors for blood transfusion. Simply by exercising care in this respect, an increase in the incidence of post-transfusion malaria after the war can be prevented.

Summary

Since 1929, of 12 cases of post-transfusion malaria reported in Massachusetts, 9 were quartan, 2 tertian, and 1 undetermined.

The predominance of quartan infections is evidence that in a nonendemic area the problem of post-transfusion malaria is intimately linked with the ability of *Plasmodium malariae* to remain latent for long periods of time.

Because of the absence of insect-borne transmission in a nonendemic area, latency may be determined with a greater degree of accuracy in such an area than in an endemic one in which reinfection is difficult to exclude.

The widespread use of whole-blood transfusions in medical practice and the return to this country of large numbers of carriers from endemic areas may act together to increase the hazard of accidental transmission of malaria in the post-war period.

An increased incidence of tertian malaria as a result of accidental transmission may be prevented after the war by eliminating prospective donors for whole-blood transfusions who have lived in endemic areas.

References

1. Wang, C. W., and Lee, C. U. Malaria and relapsing fever following blood transfusion: including report of case of congenital transmission of relapsing fever. *Chinese M. J.* **50**:241-248, 1936.
2. Thoroughman, J. C. Malaria transmission by blood transfusion. *Chinese M. J.* 58:682-686, 1940.
3. Getting, V. A. Malaria in Massachusetts. *New Eng. J. Med.* **230**: 350-357, 1944.
4. Hackett, L. W. *Malaria in Europe.* London: Oxford University Press, 1937.
5. Ackermann, V., and Filatov, A. On possibility of preventing transmission of malaria by blood transfusion: experimental study of bactericidity of conserved blood with respect to Plasmodium malariae. *J. Trop. Med.* **37**:49-57, 1934.
6. Antschelewitsch, W. D. Transfusion von konserviertem Malarikerblut. *Folia haemat.* **57**:406-416, 1937.
7. Korteweg, P. C., and Swellengrebel, N. H. Wanneer heeft ten onzent de malariabesmetting plaats? *Nederl. tijdschr. v. geneesk.* **65**²:1485-1489, 1921.
8. Stein, H. B. Transmission of malaria by transfusion: report of case with 2 acute developments of disease when blood from same donor was used. *Am. J. Dis. Child.* **44**:1048-1054, 1932.

CLINICAL NOTE

GASTROSCOPIC STUDIES IN NAVAL PERSONNEL WITH CHRONIC SEASICKNESS*

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IN a group of 150 cases of chronic seasickness studied clinically at the United States Naval Hospital in Chelsea, Massachusetts,[1, 2] routine gastrointestinal x-ray studies showed that 50 per cent had a characteristic roentgenologic appearance.[3] These cases showed a constant triad of findings, namely, hypersecretion, loss of gastric motility and spasm of the pylorus. In a few cases there was in addition evidence of a moderate degree of hypertrophic gastritis, seen when a thick barium solution was used to bring out the gastric rugae.

It was considered highly desirable to confirm these findings by direct gastroscopic examination. Since facilities for this examination were not available at the naval hospital, it was performed at the Gastroscopic Clinic of the Massachusetts General Hospital. The patients did not receive breakfast or lunch on the day of the examination and were usually given 0.1 gm. of Nembutal on leaving the naval hospital, so that a mild degree of relaxation was possible when they reached the civilian clinic. They were for the most part examined within five days of being sent ashore from the small vessels on which they had been seasick. They had had from four to six weeks of protracted seasickness, with extreme vomiting, weight loss and a decrease in efficiency.

The results of gastroscopic examination in 22 men showed moderate hypertrophic gastritis (1 case), moderate superficial gastritis (2 cases), slight superficial gastritis (3 cases), gastric spasm without gastritis (2 cases) and a normal stomach (14 cases). As pointed out by Benedict and Mallory,[4] superficial gastritis as described by the gastroscopist corresponds to the acute exudative gastritis of the pathologist. Hypertrophic gastritis as described gastroscopically corresponds to an exaggerated form of the physiologic plasma-cell and lymphocytic infiltration of the normal stomach (chronic gastritis).

Most of the patients were under twenty-five years old, an age group in which one would expect to find a comparatively normal gastric mucosa. Although a series of 22 cases is too small a one from which to draw any final conclusions, the finding of a normal stomach in 14 of them indicates that seasickness does not usually cause changes in the gastric mucosa.‡ The only patient showing any degree of chronic (hypertrophic) gastritis was a man of forty-one who had suffered mild seasickness before joining the Navy and had then suffered two months of severe perpetual seasickness. Two other patients had spasm without gastritis, and 3 of the remaining 5 showed only slight superficial gastritis, which in 2 cases was confined to a small area. In 1 of the latter cases, re-examination six weeks later revealed a normal stomach. Of the 2 patients who showed moderate superficial gastritis, 1 was a habitual user of alcohol. Hence, the thickened rugae observed by x-ray examination in many of these cases were not confirmed by gastroscopy and cannot be considered as positive evidence of gastritis.

Conclusion

Although 50 per cent of cases of chronic seasickness present x-ray evidence of hypersecretion, loss of gastric motility and spasm of the pylorus, as well as thickened gastric rugae in some, the gastroscopic picture is usually essentially normal.

References

1. Schwab, R. S. Chronic seasickness, neurological, psychiatric and naval aspects. *U. S. Nav. M. Bull.* **40**:923-936, 1942.
2. *Idem.* Chronic seasickness. *Ann. Int. Med.* **19**:28-35, 1943.
3. Goehring, H. D. Personal communication.
4. Benedict, E. B., and Mallory, T. B. Correlation of gastroscopic and pathological findings in gastritis. *Surg., Gynec. & Obst.* **76**:129-135, 1943.

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‡The cases reported herein are not to be confused with those of so-called "destroyer stomach," which usually exhibit severer and more prolonged pain and distress. Such patients also frequently have x-ray evidence of thickened gastric rugae, but in only half of these cases does gastroscopy reveal any degree of gastritis.

MEDICAL PROGRESS

PRACTICAL ASPECTS OF OXALATE METABOLISM (Concluded)*

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OXALATE LITHIASIS

Urinary lithiasis is a broad subject. There are a number of excellent general papers that are of considerable value for the purpose of orientation in this complex field.[82–89] There has been an increasing interest in recent years in the pathogenesis of urinary calculi. Many factors, such as hyperparathyroidism, persistent hypercalcinuria, urinary-tract stasis, a persistently alkaline urine, infection of the urinary tract with urea-splitting organisms and prolonged recumbency, have been established as causes of phosphate calculi. Furthermore, the prevention of their recurrence and even their dissolution by chemical means have had some measure of success. By contrast, the pathogenesis and therapy of oxalate calculi remain enigmatic. Burkland[90] has given the best modern appraisal of the problem. This paper and those by McIntosh[91] and Hammarsten[92, 93] should stimulate a renewed interest in oxalate calculi.

One of the most important aspects of oxalate metabolism is its role in the causation of calculi in the urinary tract. Oxalate stones occur both in a relatively pure form as calcium oxalate and as mixed stones. They are exceedingly frequent and are therefore of considerable clinical interest. Their frequency as contrasted with that of other types of stone is well shown in Table 2, which is based on the chemical analysis of stones as reported by several authorities.[91, 94–96] Barney and Jones[88] state that from 1936 to 1940 analysis of stones removed at operation or passed spontaneously at the Massachusetts General Hospital showed phosphates in 59 per cent and oxalates in 33 per cent. Burkland[90] reports that among 112 cases of urinary-tract calculi analyzed at the Brady Urological Institute there were 62 in which the stones were composed of pure calcium oxalate or of calcium oxalate and phosphate. Thompson et al.[97] report that the quantitative chemical analysis of urinary calculi in 47 cases revealed 78 per cent to be of the calcium oxalate-phosphate type, with the heavy calculi containing more phosphate and those of light weight relatively richer in oxalate. It thus appears that in the United States more than 30 per cent of all stones of the urinary tract are of oxalate origin. The incidence of mixed oxalate stones is high, since calcium oxalate occurs in acid urine in association with uric acid and urates and in alkaline urine with amorphous phosphates. Predominant calcium oxalate stones develop only in acid urine.[90, 91] Because of their frequent small size oxalate stones often enter the ureter and make up a large percentage of ureteral stones. Because of their rough surface they frequently cause colic and hematuria. In the so-called "stone belt" of Central Europe (see below) the percentage of oxalate stones is said to reach 65 per cent of all urinary tract calculi.[98, 99]

Oxalate calculi occur in several forms[100]—as small, smooth, round or faceted stones, not larger

TABLE 2. *Frequency of Various Types of Urinary Calculi.**

TYPE OF STONE	RANDALL[95]		KRETSCHMER[94]	LA TOWSKY[96]	MCINTOSH[91]
	KIDNEYS	URETER	URETER	ENTIRE URINARY TRACT	ENTIRE URINARY TRACT
Calcium-magnesium phosphate	39	49			
Calcium phosphate-carbonate					9
Calcium phosphate			47	13	
Calcium oxalate	11	39	39	33	50
Calcium carbonate	4	4	6	14	
Triple phosphates	7		4		
Magnesian†					29
Cystine	4	1	3	2	1
Uric acid and urates	6	7	1	10	11
Miscellaneous pure stones			2	6	
Mixed stones	80	59		72	
Totals	151	159	102	150	100

*The classification of stones varied with each author. Pure stones were generally considered to be those with a predominance of one or in some cases two elements. McIntosh's classification is chiefly based on the presence or absence of the metallic elements.

†Magnesian stones contain not only calcium carbonate and calcium phosphate but also magnesium and ammonium.

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than a pea and usually found in the renal pelvis or ureter; as "mulberry calculi," so named because of mammillary processes on their surfaces, of larger size and more frequent in the bladder; as those of so-called "jackstone shape," a rare type with projecting spurs, seen in the bladder; and as crystalline calculi, small stones with their surfaces completely covered with sharp, glistening crystals, which are exceedingly irritating. Many of the small oxalate stones passed naturally or found at operation in persons with uninfected urine are of the last type. In contrast to those composed of calcium phosphate and cystine, staghorn calcium oxalate calculi are rare.

Calcium oxalate calculi are extremely dense and readily demonstrable on a K. U. B. roentgenogram. The roentgen appearance of spicules radiating from a central focus is seen at times and is pathognomonic of this type of calculus (see illustration[83, 101]). According to the Schinz experiment, as tabulated by Morrison,[102] the relative densities of urinary calculi on roentgen-ray examination are: water and body tissue, 1; xanthine, 1.2; urates, 1.38; cystine, 3.7; ammonium magnesium phosphate, 4.1; calcium oxalate, 10.8; calcium carbonate, 15.0; and calcium phosphate, 22.0. Others rate calcium oxalate as the densest of all.[90, 100]

Heredity is not generally considered a factor in the pathogenesis of oxalate calculi. Nevertheless, there are isolated papers in which this possibility is considered. Gram[103] has reported the study of five generations of a family in which calcium oxalate urinary concretions occurred with great frequency. This predisposition to form calculi was apparently inherited dominantly but showed itself clinically almost exclusively in males.

Oxalate calculi may occur in acid, neutral or alkaline urine and remain insoluble in either acid or alkaline urine. It is also generally agreed that neither stasis nor infection of the urinary tract predisposes to the formation of calcium oxalate stones. This is in sharp contrast to calcium phosphate calculi.

There are a number of areas in the world where oxalate stones are particularly prevalent. In some of these the calculi appear to be related to a vegetable diet of high oxalic acid content. This is by no means constant, for in other equally prominent stone areas the diet is noticeably low in oxalates.[89, 98–100, 104] Here the source of the urinary oxalates appears to be of intestinal or endogenous origin. A most remarkable phenomenon has been noted in the area of Central Europe blockaded during World War I.[98, 99] Starting about 1919, reaching a sharp peak in 1924 and remaining sustained until at least 1937, there was a striking increase in the incidence of oxalate stones, at times reaching ten times the usual incidence. Oxalate stones were said to constitute 65 to 90 per cent of all stones studied by urologists in this area. The stones were small, renal in origin, often unilateral, easily passed and frequent in middle-aged adults, and recurred only infrequently. A careful analysis of possible etiologic factors led Grossmann[98, 99] to conclude that the basic cause remained obscure. Winsbury–White[105] suggested that a dietetic fault seemed highly probable. Hammarsten's[92, 93] experimental production of oxalate stones in rats on a diet low in magnesium is a new concept that may possibly shed some light on the reason for this stone wave. The magnesium content of foods varies with the content of this element in the soil. Prevention of its depletion from the soil in turn depends on the agricultural methods and type of fertilizer used.[106] Whether or not this can predispose toward human oxalate lithiasis remains to be proved.

Many attempts have been made to associate oxalate stones with oxaluria. Although this may in general be true, it appears that oxaluria may persist for years without oxalate stones' developing, and conversely that oxalate stones are not always associated with hyperoxaluria or demonstrable oxalate crystals in the urine. The many factors increasing the oxalate content of urine are discussed below. It is not clear what role these have in the production of oxalate stones. It has been stated that persons with oxalate stones after eating foods rich in oxalic acid occasionally show either an unusually high blood and urine oxalate content or one less than the normal supply.[90] Such inconsistent results make evaluation of this factor difficult.

Calcium oxalate in the normal urine is usually supersaturated — from two and a half to three and a half times at a pH of 5.5, according to Lassen,[107] to as much as six- to eightfold according to others.[100, 106] Hydrotropic and colloidal substances present in the urine are undoubtedly responsible for at least part of this increased solubility of calcium oxalate as compared with its solubility in distilled water. The influence of urea in increasing the solubility of calcium oxalate in water is illustrative of this mechanism.[108, 109] It is therefore possible that the formation of oxalate stones depends more on decreased solubility due to some disturbance in such a protective colloidal mechanism than on an absolute increase of urinary excretion of oxalates. Unfortunately, but little is known concerning the factors controlling the protective colloidal mechanism. Furthermore, the primary role of this mechanism has recently been questioned.[91]

The crystals formed in a colloid menstruum in vitro differ from those of the same substance formed in a watery solution.[110] Ord and Shattock[111] showed many years ago that the so-called "coalescent forms" of oxalate crystals constituted the structural units of oxalate calculi as seen microscopically.

Lassen[107] administered to patients a saline solution containing calcium, magnesium and phosphate (Hammarsten's mixture) and a solution of sodium chloride and magnesium chloride, with promotion of

diuresis and diminution in concentration of oxalate and an increase in magnesium and calcium in the urine. Consequently, the urine became less saturated with calcium oxalate. The therapeutic implication of this observation remains to be determined.

Small calcium oxalate stones with a single faceted area suggesting attachment and development from a primary lesion on a renal papilla have been noted on occasion.[105, 112, 113] Although this may explain their origin, the continued growth of calculi apparently depends on other factors.

Much interest has been aroused in recent years in the relation of citric acid metabolism to renal calculi and the possible therapeutic value of the use of citrate or agents that control its urinary excretion in the management of calculi[114–117] as well as the use of aluminum hydroxide gels to divert phosphate excretion from the urinary to the intestinal tract.[117] Citrate solutions containing magnesium used locally in the urinary tract have successfully dissolved stones.[118] These new concepts, however, appear to be related to stones composed of phosphates or carbonates rather than of oxalates.

Oxalate calculi have been produced experimentally in animals. Renal calculi produced by vitamin A deficiency in animals are composed of phosphates and carbonates but not of oxalates.[119] Keyser[40, 41] noted the formation of oxalate calculi in rabbits following the production of an intense artificial oxaluria by administration of oxalic acid esters and calcium salts subcutaneously.

In an exacting and well-controlled experiment utilizing over 900 rats, Hammarsten[92, 93] not only produced oxalate calculi but apparently elucidated some of the pathogenic factors involved. These striking results are worthy of careful attention and, since the original papers are not readily accessible, will be listed in some detail. A magnesium-poor diet in rats produced oxalate stones, with or without an adequate intake of vitamins A and D, but the stones were larger and more numerous with avitaminosis. Additional oxalates in the diet favored stone formation but was not essential, since calcium oxalate stones also formed on an oxalate-free diet. Paradoxically, a diminution in calcium in the food increased the elimination of calcium in the urine and was more marked when the animal was deficient in vitamin D. A low-magnesium, high-oxalate, low-vitamin diet gave the highest incidence of stones. An analysis of the urine of animals with experimental calcium oxalate calculi showed it to be acid and sterile, with decrease of the magnesium content and increase of the calcium and oxalic acid content. Furthermore, if the diet yielded a low urine pH calcium oxalate stones were formed, whereas with an increase in pH calcium phosphate calculi were noted.[92, 93] Possible factors considered responsible for the calculus formation were as follows: a low magnesium content of the urine caused by a low magnesium intake, which decreased the solubility of calcium oxalate; some ill-defined disturbance in metabolism due to the magnesium deficiency; a negative calcium balance and increased calcium excretion; and the excretion of more oxalic acid than was obtained in the diet.

Increase of magnesium in the diet without an increase in vitamins caused a diminution in urinary calcium excretion. A vitamin-deficient diet together with a low calcium intake led to mobilization of calcium from the skeleton, with resultant negative calcium balance and high urinary calcium excretion. Increasing the amount of magnesium in the diet apparently decreased the excretion of oxalic acid, increased the solubility of urinary calcium oxalate, and at the same time diminished the urinary elimination of calcium.

Hammarsten also succeeded in decalcifying preformed calculi. Animals were kept on the stone-producing regime until roentgen-ray study revealed the presence of calculi. The diet was then changed to one rich in calcium, magnesium and all the vitamins. After several months, post-mortem examination of the sacrificed animals showed complete or almost complete decalcification of the stones, but with the organic matrix still present.

It is well to note that Hammarsten's work awaits confirmation, and further that it is not known whether the principles evolved in her animal experiments are applicable to man. The experiments suggest that the metabolism of oxalic acid plays a secondary role and that calcium and magnesium metabolism are more important factors in the production of calcium oxalate stones. Joly[106] has stated that a great advance in our knowledge of the conditions underlying stone formation will be made if Hammarsten's work is confirmed.

Burkland,[90] on the basis of available experimental and clinical evidence, suggests that the tendency to formation of oxalate stones in the urinary tract may be decreased by a well balanced diet, by the sparing use of foods of high oxalic acid content, by an increased intake of vitamins A and B, by a decrease of carbohydrates in the diet to cut down intestinal fermentation and the production and absorption of oxalic acid, by eliminating constipation, chronic indigestion and so forth, by avoiding worry, by drinking eight to ten glassfuls of water daily, by a diet relatively rich in proteins, by some form of daily exercise and by eliminating foci of infection. His paper contains a specimen dietary instruction sheet, suitable for patients, that embodies the aforementioned ideas and a simplified table of oxalic acid content of foods.

Hammarsten,[92, 93, 120] on the basis of her animal experiments, has suggested a prophylactic diet of possible value in preventing the recurrence of oxalate calculi. The diet recommended is one with adequate calcium, magnesium and phosphorus in easily absorbable forms, low in oxalate-rich food, ample

whole-grain products, a variety of fruits and vegetables (consumed raw or with water used for cooking), milk, butter, meat and meat broth. If necessary, medicinal calcium and magnesium can be used to supplement the diet. Magnesium is present in many natural foods, so that a well-balanced diet should furnish an adequate amount. There may be some loss in water used for cooking. The true value of these prophylactic regimes for preventing the formation of oxalate calculi in human beings remains to be adequately established, but for the present they can be considered to rest on a rational basis. It is well to recall, however, that the results obtained from animal experiments are not always directly applicable to man.

The Metabolism of Oxalates

Blood and Urine Levels

There is considerable variation in the reported values for the normal oxalate content of the blood, as may be seen from Table 3, apparently depending to a great extent on the method used.[121–130] No attempt will be made to review or compare all the methods. Barrett[130] has recently evaluated results

Table 3. *Normal Oxalate Content of the Blood.*

Source	Species	Oxalate Content mg./100 cc.
Merz and Maugeri[121]	Man	3.0
	Rabbit	6.0–9.0
Loeper[123]	Man	1.0 or less
Jürgens and Spehr[122]	Man	5.22–9.72
	Dog	5.40–19.26
Suzuki[124]	Man	4.0–6.0
Kamiya et al.[125]	?	2.0–4.0
Steinberg and Brown[126]	Man	5.5–7.5
	Rabbit	4.5–6.0
Leulier and Dorche[127]	Horse	0.227–0.270
	Ox	0.218–0.276
	Sheep	0.268–0.485
Steinberg et al.[128]	Man	5.0–7.5
Barber and Gallimore[129]	Man	0.4–0.6
	Rabbit	0.4–0.8
Barrett[130]	Man	0.23–0.77 (Average, 0.48)

obtained by means of the three most widely used procedures, namely, the cerous chloride precipitation method of Izumi, Suzuki[124] and other Japanese investigators, the lime water precipitation method of Merz and Maugeri[121] and the ethyl oxalate procedure of Dodds and Gallimore.[131] He was unable to confirm the high values obtained by the methods of the Japanese workers or of Merz and Maugeri. He concluded that the low values obtained by Dodds and Gallimore were of the correct order of magnitude. Furthermore, he cast some doubt that the oxalate obtained by any procedure is entirely preexistent oxalate, since the mere addition of ascorbic acid to blood prior to the determination increased the oxalate content by 0.025 mg. for each 1 mg. of ascorbic acid added.

Some reported values for the oxalate content of the urine are given in Table 4.[53, 123, 132–136] These values also are subject to question because of the lack of reliability of the methods used, although there is a greater uniformity here than in the values reported for blood oxalate.

It is important to bear in mind in any evaluation of the published reports that the results are often open to question and not frequently are invalid.

Oxalate Values in Various Diseases

In addition to the hyperoxalemia and hyperoxaluria reported in the syndrome of oxaluria, there are numerous references to elevations in a variety of

Table 4. *Normal Oxalate Content of the Urine.*

Source	Species	Oxalate Content mg./24 hr
Loeper[123]	Man	20.0 mg. (per liter)
Borgström[135]	Guinea pig	0.57–0.87
Herkel and Koch[132]	Rabbit	5.0–15.0
	Man	21.5 (average)
Müller[133]	Man(?)	20.0–40.0
Widmark[134]	Man	14.0–56.0
Oikawa[135]	Rabbit	5.6–15.9
Adolph and Liang[136]	Rat	1.0
Barrett[53]	Man	20.0–47.0 (Average, 33 mg.)

unrelated diseases. These reports are found almost entirely in the foreign literature, much of which is not available. Consequently, no attempt has been made to review this subject completely. References are made merely to certain illustrative papers to indicate the apparent wide scope of the subject.

Jürgens and Spehr[122] found blood oxalate values elevated in diseases of the liver, with a tendency to parallel the serum bilirubin level. Pennetti[137] reported similar clinical findings and experimentally produced hyperoxalemia in rabbits and dogs by ligation of the common bile ducts. Herkel and Koch[132] found high urinary values in a patient with cirrhosis of the liver without jaundice who was being maintained on a high-carbohydrate diet. In addition, they demonstrated that the ingestion of 600 to 800 gm. of spinach (equivalent to 3 or 4 gm. of oxalic acid) by 2 patients, one with cirrhosis of the liver with ascites and the other with cirrhosis with jaundice, caused a marked elevation in urinary oxalate content. This they attributed to an elevation in blood oxalate, although they made no determinations on the blood.

Scaglioni[138] found the blood oxalate level of patients with compensated cardiac disease to be normal. With development of edema and oliguria the blood level rose and the urinary excretion became relatively greater, although the total daily output was unaffected. With improvement of the cardiac status under routine therapy the blood oxalate values returned to normal. Loeper et al.[139] noted similar findings in patients with varying degrees of cardiac failure. Simultaneously determined values for urinary oxalate convinced them that the oxalemia could not be explained on the basis of renal insufficiency.

Scaglioni[140] also investigated the level of blood and urine oxalates in various types of renal disease, with and without insufficiency. He found no variations from normal when renal function was normal, as tested by the blood nonprotein nitrogen and by concentration and dilution tests. With renal insufficiency the blood oxalate became elevated, but the urinary values varied from low to normal to high. If improvement occurred, however, the urinary oxalate increased as the blood oxalates returned to normal. Although the oxalate level of the blood tended to be high, it did not exactly parallel the intensity of the clinical manifestations. Khouri[141, 142] and Jürgens and Spehr[122] have reported hyperoxalemia, and Herkel and Koch[132] have noted hyperoxaluria, in uremia.

A number of investigators[122, 123, 143–145] report that diabetes mellitus is associated with hyperoxalemia oxaluria or both. Herkel and Koch,[132] however, were unable to find any relation between the urinary values for glucose and those for oxalic acid. The blood oxalate values parallel the blood sugar values and respond to insulin in a similar manner.

In addition, deviations from normal values have been noted in certain severe diseases of the central nervous system,[146] chronic nongouty arthritis,[147] gouty arthritis,[147] severe anemias[142] and leukemia.[142]

Source of Blood and Urine Oxalates

The oxalate of the blood and urine is derived from several sources not all of which have been adequately proved. The largest and best understood source is oxalate pre-existent in food. The oxalate content of certain foodstuffs has been listed in Table 1. This is present as insoluble calcium oxalate, as soluble sodium or potassium oxalate and in very slight amounts as oxalic acid. The calcium oxalate is relatively insoluble, is absorbed from the intestinal tract with great difficulty and is largely excreted in the feces. The degree to which it is absorbed is thought to be related to the gastric acidity and may be increased in the presence of hyperchlorhydria. Herkel and Koch[132] studied the oxalate excretion in the urine after the administration of spinach. In normal persons increase occurred during the six hours following ingestion, but this response could be diminished by atropine and greatly enhanced by histamine. Patients with achlorhydria failed to show oxaluria after ingestion of spinach and were uninfluenced by histamine, but developed oxaluria if hydrochloric acid was administered with the spinach. From this they concluded that gastric acidity is an important factor in determining the degree of absorption of oxalates from the gastrointestinal tract. The soluble oxalates present in foods may be absorbed as such or be changed to insoluble calcium oxalate by combination with calcium in the diet. Thus, it has been demonstrated that the addition of milk, calcium chloride or calcium carbonate to the diet prevents the oxaluria that follows the ingestion of an oxalate-rich food.[58] It is important to emphasize that the oxalic acid values listed in Table 1 are figures for total oxalates expressed as oxalic acid. They do not differentiate the relative proportions of readily absorbable or difficultly absorbable forms, and are therefore not necessarily indicative of ability to elevate the blood or urine oxalate levels.

In addition to preformed oxalate it has been suggested that certain foodstuffs are potential sources, since oxalates may be intermediary products in their metabolism (the so-called "oxaligenic foods of Loeper"). Of these the most important are carbohydrates, especially glycogen and starches (Loeper,[58] Loeper et al.[143] and Oikawa[148]). Pure protein — for example, gelatin and plasma — and fats are not considered as precursors of oxalate, but meat and foods rich in connective tissue rank next to carbohydrate. Herkel and Koch[132] studied 11 patients on an oxalate-poor diet with a constant protein and varying carbohydrate and fat content. The results were not constant, but patients tended to have greater urinary oxalate excretion on high-carbohydrate diets than on low-carbohydrate ones. Jürgens and Spehr[122] studied the blood sugar and oxalic acid levels of normal patients after the oral administration of glucose. They found that the blood oxalate level tended to parallel the glucose level. The peak was reached somewhat earlier on the oxalate curve, and the decline was somewhat slower. They suggested that the oxalemia reported to be present in many patients might be explained on a basis of low sugar tolerance.

Second to the oxalate of food (actual or potential), the metabolic processes of certain intestinal bacteria and parasites have been emphasized as sources of oxalate. Loeper et al.[143] refer to experiments by various observers that demonstrate the formation of oxalic acid during in vitro studies on species of Aspergillus and Mucor and on the colon bacillus. Finck[149] credits Guidiceandrea with establishing in 1933 for the first time a relation between intestinal parasitosis and oxaluria. He suggests that "toxins" from the parasites interfere with the metabolism of the liver and thereby cause hyperoxalemia. Khouri[150] finds blood oxalates to be elevated frequently in patients with filariasis and bilharziasis, and postulates that a "toxin" diminishes the oxalolytic action of the liver. A relation between oxaluria and amebic dysentery has been emphasized.[63] Loeper[58] calls attention to the association of oxaluria with Taenia infestation and suggests that the source of the oxalate is the metabolism of the parasite within the intestine. He and Tonnet[151] report on in vitro experiments that demonstrate that, during the metabolism of Taenia, glucose and oxalic acid are formed at the expense of glycogen. Finck[149] reviews the literature and reports 58 cases of oxaluria in which parasitic infestation was present as follows: 7 cases with Lamblia, 2 with Taenia and 49 with

Ascaris. He reports that examination of the stools in these patients showed, in addition to the evidence of parasitic infestation, large numbers of calcium oxalate crystals and an increase in undigested starch granules. He postulates that the parasites interfere with the normal functioning of the pancreas and thereby indirectly affect oxalic acid metabolism. He states that the successful elimination of the parasites was accompanied by disappearance of oxaluria. Buche[152] comments on the frequent association of colon-bacillus bacteriuria and oxaluria. Piccininni and Lombardi[153, 154] isolated a strain of colon bacillus that produced oxalic acid in vitro and caused oxaluria when administered in capsules to healthy subjects.

A third source of blood and urinary oxalate is the intermediary metabolism of tissues. This is by far the most controversial and confusing of all the aspects of the subject. In view of the questionable reliability of the methods used and the doubtful accuracy of many of the reported experiments, it is impossible to evaluate the status of the problem. The basis for the concept of endogenous production of oxalate lies in the demonstration that animals and human beings maintained on supposedly oxalate-free diets or undergoing starvation experiments continue to excrete oxalic acid in the urine. This finding has been verified by a number of observers — Herkel and Koch[132] in rabbits, Borgström[155] in guinea pigs, Jürgens and Spehr[122] in dogs, Adolph and Liang[136] in rats and Herkel and Koch[132] and Jürgens and Spehr[122] in man. It has been suggested that oxalic acid is related in some mysterious manner to the metabolism of carbohydrate. This originally arose from the fact that in vitro oxalic acid is produced by the action of nitric acid on glucose — hence the name "sugar acid." Loeper[58] considers tissue carbohydrate, especially glycogen, to be a potent source of oxalic acid. He and his co-workers[156] report that experiments on slices from rabbit's liver and heart show that, as the tissue glycogen decreases, the glucose and oxalic acid increase. In addition, Loeper[145] claims that the coexistence of hyperglycemia and hyperoxalemia in diabetic patients and the simultaneous response of each to insulin support the concept of a specific interrelation. The previously mentioned experiments of Herkel and Koch and of Jürgens and Spehr tend to substantiate this idea. Oikawa[157] reports an extensive literature showing that hyperglycemia induced by the injection of glucose or adrenalin is accompanied by hyperoxalemia and often by oxaluria. His own experiments, although purporting to substantiate those of other observers, fail to show a significant effect of either glucose or adrenalin.

In addition to the investigations on the interrelation of carbohydrates and oxalic acid metabolism, a variety of other substances have been studied. Most of the work has been directed toward the discovery of oxalate precursors by means of the determination of blood and urine oxalate after the administration of test substances. Glucose,[124] asparlic acid,[124] asparagine,[124] ethylene glycol,[158] ethylene monoacetate,[158] glycine,[129] creatinine,[129] purines,[129] glyoxal[122] and glycolic acid[122] have been reported as leading to an increase in oxalic acid. A decrease in oxalate is said to follow the administration of pyruvic acid.[124] Glycine,[124] alanine,[124] glutamic acid,[124] butyric acid,[124] fructose[122] and oxamide[122] have been ineffective.

Some evidence has accumulated that implicates purine and pyrimidine metabolism in the production of oxalic acid. Rodillon[77] suggested a schema in which oxalic acid appeared as an end product of a series of reactions beginning with uric acid and progressing through alloxan, oxaluric acid and finally urea and oxalic acid. It is perhaps of interest to note that alloxan, now widely used in the experimental production of diabetes, is a ureide of mesoxalic acid.

In this country some support for the inter-relation of pyrimidine and oxalic acid metabolism has been obtained from the work of Cerecedo and his associates.[159–162] They fed to dogs various substances considered as possible intermediaries in pyrimidine metabolism and then measured the urea and the oxalic acid content of the urine. Although aware of the inadequacy of the methods for the determination of oxalic acid, they concluded that their results had relative, if not absolute, significance. Uracil, oxaluric acid, formyloxaluric acid, isobarbituric acid and isodialuric acid resulted in an elevation of urinary urea, and oxaluric acid also caused a rise in urinary oxalic acid. In addition, parabanic acid caused an elevation of urinary oxalate but along with alloxan and alloxantin did not appear to be involved in the metabolism of uric acid. As a result of these investigations, the authors suggested a schema beginning with uracil and progressing through isobarbituric acid, isodialuric acid and oxaluric acid to the end products, urea and oxalic acid. This is an interesting series of experiments that apparently have been neither confirmed nor disproved. It is interesting to speculate whether such a substance as thiouracil could give rise to oxalic acid.

It is probably worth mentioning at this point that in the citric acid cycle postulated for the oxidative breakdown of pyruvate, a schema in which vitamin B is intimately involved, a number of dicarboxylic acids have been implicated.[163] Thus, citric, α-ketoglutaric, succinic, fumaric, malic and oxalacetic acids have important places in the cycle. The structural relation of oxalacetic and oxalic acid might give rise to speculations concerning a possible physiologic relation. At the present time, however, there is no available evidence that oxalic acid is concerned in the intermediary metabolism of the citric acid cycle or is connected in any manner with the formation or breakdown of oxalacetic acid in cellular metabolism.

Blood oxalate levels are reported as elevated under the influence of adrenalin,[157, 164] thyroxine[164] and anoxemia.[165] The administration of insulin[58, 145, 164] and thyroidectomy,[164] on the other hand, cause a fall. Urinary oxalate is elevated on exposure to hydrocyanic acid[166] and after exercise.[167] Dinitrophenol[166] and quinine[166] cause a fall in urinary oxalate.

Fate of Oxalates

The confusion centered around this aspect of the subject is enormous, and will not be clarified until a satisfactory method for the accurate determination of small quantities has been developed. The perplexity of the problem at the present time can best be demonstrated by enumerating some of the theories[132, 136, 143, 155, 156, 168–170] that have been suggested: oxalic acid is oxidized in the body; it is resistant to further breakdown; all organs are able to metabolize oxalic acid; blood forms and decomposes oxalic acid; skeletal muscle oxidizes oxalic acid but liver does not; oxalic acid is formed in the liver and skeletal muscle; liver cells destroy it; liver cells excrete it into the bile; oxalic acid is a source of carbon monoxide in the body; it is formed at the expense of uric acid; it is transformed into carbonate; it is changed into formic acid; and it is formed under conditions of reduced tissue metabolism.

There is no doubt that oxalates are excreted by the gastrointestinal tract and the kidney and appear in the urine, and there is some evidence that they also may be excreted in the bile. Their persistence in the urine during starvation suggests that to a certain extent they are endogenous in origin, but this problem as well as that of their subsequent fate requires further investigation.

Anticoagulant Activity of Oxalic Acid and Certain Plant Extracts

In 1939, Steinberg and Brown[126] reported briefly that extracts of certain plants decreased the coagulation time of rabbit's blood. Among the potent sources of these extracts were shepherd's purse, wood sorrel, beets, oxalis, citrus fruits, rhubarb and euphoria. Attempts to determine the active principle resulted in the isolation of a colorless, crystalline material that they identified as oxalic acid. Of the various extracts, that from shepherd's purse apparently is best known. Copley and Lalich[171] state that it is a common North American and European weed that in the past was used internally, as well as locally, to control hemorrhage. The report that oxalic acid administered parenterally accelerated coagulation of blood was rather startling in view of its well known anticoagulant activity in vitro. Nevertheless, it was used in the treatment of a large number of patients with a variety of hemorrhagic tendencies, as well as prophylactically to prevent postoperative bleeding. Steinberg et al.[128] reported more fully on their work in 1940 and concluded that the normal blood oxalate values range between 5.0 and 7.5 mg. per 100 cc.; that the coagulation time of blood varies inversely with its oxalic acid content; that the intravenous administration of oxalic acid causes a rise in blood oxalate greater than can be accounted for by the quantity of oxalate injected; that the intravenous injection of oxalic acid causes a decrease in coagulation time; and that the administration of parenteral oxalic acid to several thousand patients with various types of hemorrhage gave a high incidence of gratifying results. It is important to note that their oxalate determinations were made by a modification of Suzuki's method, a procedure recently criticized by Barrett[130] and that their coagulation times were determined by the capillary-tube method, which is of questionable reliability.

Schumann[172] reported the use of Koagamin, of which the active principles are oxalic and malonic acid, in a variety of obstetric and gynecologic hemorrhagic episodes with satisfactory clinical results, but his published studies are inadequate and the results are not convincing. Milliken,[173] in the same year, reported the successful use of Koagamin in the prevention of postoperative hemorrhage in prostatic surgery. He stated that the coagulation time was reduced by half, but failed to note the method used and gave no protocols. Martin[174] reported that intravenous oxalic acid reduced the clotting time of vitamin K-deficient chicks almost to normal and decreased the prothrombin time. In rabbits, he found that doses between 0.5 and 30.0 mg. per kilogram of body weight caused a reduction in clotting time, whereas toxic doses of 100 mg. per kilogram caused a prolongation. The clotting time in heparinized rabbits was unaffected. Page,[175] using the Lee–White method for the determination of clotting time, reported transient reductions to the upper limits of normal in three hemophiliacs after the intravenous injection of oxalic acid. One patient, however, failed to respond to a second administration. Blain and Campbell[176] reported experiments on rabbits and on 440 operative cases involving a wide variety of surgical procedures and claimed that the clinical results were excellent. Likewise, Herbst and Weinstein,[177] using Koagamin on 15 normal cases and 12 operative cases, concluded that a significant decrease occurred in bleeding time and coagulation time. The methods used (Duke method and capillary-tube method), however, are not the most reliable ones. Hulse[178] discussed the subject briefly, stated that oxalic acid definitely decreased blood clotting time and increased blood viscosity and was antagonistic to heparin and hirudin and recommended its use clinically. He presented no laboratory verification for his statements.

A number of investigations that fail to confirm the value of oxalic acid, although quite limited, appear to warrant attention. Foster,[179] employ-

ing doses of oxalic acid comparable to those suggested for clinical use, was unable, employing a modification of the Howell method, to demonstrate any effect on the clotting time in normal rabbits, heparinized rabbits or vitamin K-deficient chicks. With large doses in rabbits he obtained a great prolongation of clotting time. Johnson;[180] using both oxalic acid and Koagamin, obtained no effects whatsoever on the coagulation time of 5 hemophiliacs. Copley and Lalich[171] studied 2 cases of hemophilia with respect to bleeding time, clotting time and clot resistance after combined treatment with blood transfusions and an extract of shepherd's purse. All the bleeding times were normal. The clotting was decreased on one occasion only, and this followed the administration of both blood and extract. Clot resistance tended to be increased with the combined therapy. They raised the question of a phytothrombin in certain plant extracts.

In view of the fact that Koagamin is available for use, it is regrettable that most of the published experiments are based on the use of hematologic methods that are not the most reliable ones. At the present time it must be concluded that the use of oxalic acid or other dicarboxylic acids or plant extracts rich in oxalates for the treatment of bleeding disease is controversial, and that its exact value as a therapeutic measure requires further study.

References

82. Albright, F. Some medical aspects of renal stone problem. *New Eng. J. Med.* **217**:1063-1065, 1937.
83. Albright, F., Sulkowitch, H. W., and Chute, R. Nonsurgical aspects of kidney stone problem. *J. A. M. A.* **113**:2049-2052, 1939.
84. Randall, A. Etiology of primary renal calculus. *Internat. Abstr. Surg.* **71**:209-240, 1940.
85. Keyser, L. D. Urinary lithiasis; review of quarter century of research. *J. Urol.* **50**:169-150, 1943.
86. Higgins, C. C. Urinary lithiasis: collective review. *Internat. Abstr. Surg.* **68**:392-405, 1939.
87. Flocks, R. H. Preventive treatment of calcium urolithiasis. *Clinics* **3**:103-132, 1944.
88. Barney, J. D., and Jones, G. E. Some problems in management of urinary calculi. *J. Urol.* **45**:1-12, 1941.
89. McCarrison, R. Causation of stone in India. *Brit. M. J.* **1**:1009-1015, 1931.
90. Burkland, C. E. Etiology and prevention of oxalate calculi in urinary tract: plan of therapy. *J. Urol.* **46**:82-88, 1941.
91. McIntosh, J. F. Classification and chemical pathogenesis of urinary calculi. *J. Clin. Investigation* **21**:755-761, 1942.
92. Hammarsten, G. Eine experimentelle Studie über Calciumoxalat als Steinbildner in den Harnwegen. *Lunds Universitets Orsskrift* **32**:1935-1936.
93. *Idem.* Dietetic therapy in formation of calcium oxalate calculi in urinary passages. *Skandinav. Arch. f. Physiol.* **80**:165-175, 1938.
94. Kretschmer, H. L. Stone in ureter; clinical data based on 500 cases. *Surg., Gynec. & Obst.* **74**:1065-1077, 1942.
95. Randall, A. Origin and growth of renal calculi. *Ann. Surg.* **105**: 1009-1027, 1937.
96. La Towsky, L. W. Qualitative chemical analysis of urinary calculi. *J. Urol.* **49**:720-726, 1943.
97. Thompson, H. E., Steadman, L. T., Benjamin, J. A., and Scott, W. W. Quantitative microchemical and spectrographic data on renal calculi and their relation to infection. *J. Urol.* **51**:259-271, 1944.
98. Grossmann, W. Betrachtungen zur gegenwärtigen Harnsteinwelle in Mitteleuropa. *Deutsche med. Wchnschr.* **64**:1074-1077, 1938.
99. *Idem.* Current urinary stone wave in central Europe. *Brit. J. Urol.* **10**:46-54, 1938.
100. Joly, J. S. *Stone and Calculous Disease of the Urinary Organs.* 568 pp. St. Louis: C. V. Mosby Company, 1940. Pp. 34-36, 69-72, 104-118, and 197-199.
101. Kerr, H. D., and Gillies, C. L. *The Urinary Tract: A handbook of roentgen diagnosis.* 320 pp. Chicago: Year Book Publishers Incorporated, 1944. Pp. 52-76.
102. Morrison, H. R. Roentgenological study of cystine urinary calculi. *Am. J. Roentgenol.* **44**:537-551, 1940.
103. Gram, H. C. Heredity of oxalic urinary calculi. *Acta med. Scandinav.* **78**:268-281, 1932.
104. Siddall, A. C. Primary vesical calculus. *J. Urol.* **37**:268-279, 1937.
105. Winsbury-White, H. P. Some interesting features concerning 455 personal cases of urinary calculus. *Proc. Roy. Soc. Med.* **32**:163-182, 1939.
106. Joly, J. S. Some points in etiology of primary urinary calculi. *Urol. & Cutan. Rev.* **43**:637-642, 1939.
107. Lassen, H. K. Formation of urinary calculi. *J. Urol.* **50**:110-120, 1943.
108. Medes, G. Solubility of calcium oxalate and uric acid in solutions of urea. *Proc. Soc. Exper. Biol. & Med.* **30**:281-284, 1932.
109. Snapper, I., Bendein, W. M., and Polak, A. Observations on formation and prevention of calculi. *Brit. J. Urol.* **8**:337-345, 1936.
110. Keyser, L. D. Calculous disease in urinary tract: formation of stone. *Bull. New York Acad. Med.* **14**:76-97, 1938.
111. Ord, W. M., and Shattock, S. G. On the microscopic structure of urinary calculi of oxalate of lime. *Tr. Path. Soc., London* **46**:91-132, 1895.
112. Posey, L. C. Urinary concretions: study of primary calculous lesions. *J. Urol.* **48**:300-309, 1942.
113. Randall, A. Papillary pathology as precursor of primary renal calculus. *J. Urol.* **44**:580-589, 1940.
114. Kissin, B., and Locks, M. O. Urinary citrates in calcium urolithiasis. *Proc. Soc. Exper. Biol. & Med.* **46**:216-218, 1941.
115. Scott, W. W., Huggins, C., and Selman, B. C. Metabolism of citric acid in urolithiasis. *J. Urol.* **50**:202-209, 1943.
116. Shorr, et al. Relation between urinary excretion of citric acid and calcium; its implications for urinary calcium stone formation. *Science* **96**:587, 1942.
117. Shorr, E. Possible usefulness of estrogens and aluminum hydroxide gels in management of renal stone. *J. Urol.* **53**:507-520, 1945.
118. Suby, H. I., and Albright, F. Dissolution of phosphatic urinary calculi by retrograde introduction of citrate solution containing magnesium. *New Eng. J. Med.* **228**:81-91, 1943.
119. Higgins, C. C. Urinary lithiasis: experimental production and solution with clinical application and end-results. *J. Urol.* **36**:168-177, 1936.
120. Hammarsten. Cited by Ljunggren, E. Zur diätetischen Behandlung von Oxalatsteinen in den Harnwegen. *Ztschr. f. Urol.* **32**:233-238, 1938.
121. Merz, W., and Maugeri, S. Über das Vorkommen und die Bestimmung der Oxalsäure im Blut. *Ztschr. f. physiol. Chem.* **201**:31-37, 1931.
122. Jürgens, R., and Spehr, G. Zur Physiologie und Pathologie des Oxalsäurestoffwechsels. *Deutches Arch. f. klin. Med.* **174**:456-467, 1933.
123. Loeper, M. Les origines de l'oxalémie chez l'homme. *Nutrition* **3**:1-13, 1933.
124. Suzuki, S. On oxalic acid in blood. *Jap. J. M. Sc. II. Biochem.* **2**:291-303, 1934. *Physiol. Abstr.* **19**:576, 1934.
125. Kamiya, S., Noye, Y., and Sato, H. Note on direct determination of oxalic acid in blood, by precipitation with cerium salt, as described by Suzuki. *Jap. J. M. Sc. II. Biochem.* **3**:317-324, 1937.
126. Steinberg, A., and Brown, W. R. New concept regarding mechanism of clotting and control of hemorrhage. *Am. J. Physiol.* **126**:638, 1939.
127. Leulier, A., and Dorche, J. Notes sur l'oxalémie. *Compt. rend. Soc. de biol.* **132**:5-7, 1939.
128. Steinberg, A., Segal, H. I., and Parris, H. M. Role of oxalic acid and certain related dicarboxylic acids in treatment and control of hemorrhage. *Ann. Otol., Rhin. & Laryng.* **49**:1008-1022, 1940.
129. Barber, H. H., and Gallimore, E. J. Metabolism of oxalic acid in animal body. *Biochem. J.* **34**:144-148, 1940.
130. Barrett, J. F. B. Oxalate content of blood. *Biochem. J.* **37**:254-256, 1943.
131. Dodds, E. C., and Gallimore, E. J. Determination of small quantities of oxalic acid. *Biochem. J.* **26**:1242-1245, 1932.
132. Herkel, W., and Koch, K. Untersuchungen zur Oxalsäure — Ausscheidung insbesondere bei Nierensteinkranken. *Deutsches Arch. f. Klin. Med.* **178**:511-537, 1936.
133. Müller, P. Zur Biologie der Oxalsäure. *Verh. Schweiz. Physiol.* **11**:8, 1937. *Physiol. Abstr.* **22**:349, 1937.
134. Widmark, E. M. P. Studies on oxalic acid amount in urine. *Acta Med. Scandinav.* Supp. **26**:340, 1928.
135. Oikawa, S. Excretion of oxalic acid in urine and faeces under different dietary condition. *Jap. J. M. Sc. II. Biochem.* **4**:17-19, 1938.
136. Adolph, W., and Liang, C. C. Fate of oxalic acid administered to rat. *J. Biol. Chem.* **146**:497-502, 1942.
137. Pennetti, G. Metabolismo dell' acido ossalico e fegato (ricerche sperimentali). *Riforma med.* **52**:243-245, 1936.
138. Scaglioni, C. Ossalemia e ossaluria nelle affezioni cardio-vascolari. *Riforma Med.* **51**:164-169, 1935.
139. Loeper, M., Mahoudeau, D., and Tonnet, J. L'oxalémie des cardiaques. *Bull. et mém Soc. méd. d. hop. de Paris* **50**:88-91, 1934.
140. Scaglioni, C. Ossalemia e ossaluria in rapporto alla funzionalità renale. *Riforma med.* **51**:359-363, 1935.
141. Khouri, J. Uremia and oxalemia. *Bull Acad. de méd., Paris* **95**:20-23, 1926.
142. *Idem.* Sur quelques cas d'oxalémie. *Bull. Acad. de méd. Paris* **108**: 1083-1085, 1932.
143. Loeper, M., Soulié, P., and Tonnet, J. Les origines de l'oxalémie. *Presse méd.* **39**:961-963, 1931.
144. DeLucia, P., and Velandi, F. Ricerche sul metabolismo dell' acido ossalico; l'eliminazione dell' acido ossalico nel diabete umano ed ilsno com porta mento in sequito alla terapia insulinico. *Boll. soc. ital. biol. sper.* **4**:249-251, 1929. *Chem. Abstr.* **23**2: 3971, 1929.
145. Loeper, M., Soulié, P., and Tonnet, J. Insuline et oxalémie. *Compt. rend. Soc. de biol.* **107**:589-591, 1931.
146. Pennetti, G. Acido ossalico e sistema vervoso. *Riforma med.* **54**: 1871-1878, 1939.
147. Loeper, M. Rhumatisme chronique et oxalémie. *Nutrition* **2**:151-160, 1932.
148. Oikawa, S. Oxalic acid in urine and feces in cases of hyperoxalaemia induced by glucose and adrenaline. *Jap. J. M. Sc. II. Biochem.* **4**: 41-43, 1938.
149. Finck, C. J. De l'oxalurie d'origine parasitaire. *Paris méd.* **2**:62-64, 1936.
150. Khouri, J. Quelques faits relatifs à l'oxalémie. *Nutrition* **3**:21-24, 1933.
151. Loeper, M., and Tonnet, J. Production d'acide oxalique par le taenia. *Compt. rend. Soc. de biol.* **106**:716, 1931.
152. Buche, Decaux and Pagel. Colibacilluries et oxaluries latentes. *Presse méd.* **39**:1318, 1931.
153. Piccininni, F., and Lombardi, E. Origin of oxalic acid (pathogenesis of oxaluria). *Klin. Wchnschr.* **5**:260-263, 1926.

154. *Idem.* Origin of oxalic acid in oxaluria. *Riforma med.* **41**:726-729, 1925.
155. Borgström, S. Über die Ausscheidung der Oxalsäure bei Meerschweinchen. *Biochem. Ztschr.* **281**:377-382, 1935.
156. Loeper, M., Degos, R., and Tonnet, J. La formation d'acide oxalique dans certains tissus glycogènes. *Compt. rend. Soc. de biol.* **106**: 717, 1931.
157. Oikawa, S. Oxalic acid in urine and faeces in cases of hyperoxalaemia induced by glucose and adrenalin. *Jap. J. M. Sc. II. Biochem.* **4**: 41-43, 1938.
158. Wiley, F. H., Hueper, W. C., Bergen, D. S., and Blood, F. R. Formation of oxalic acid from ethylene glycol and related solvents. *J. Indust. Hyg. & Toxicol.* **20**:269-277, 1938.
159. Cerecedo, L. R. Studies on physiology of pyrimidines. III. Intermediary metabolism of uracil. *J. Biochem.* **88**:695-700, 1930.
160. *Idem.* Studies on physiology of pyrimidines. IV. Further experiments on intermediary metabolism of uracil. *J. Biochem.* **93**: 269-273, 1931.
161. Stekol, J. A., and Cerecedo, L. R. Studies on physiology of pyrimidines. V. On effects of certain pyrimidines on sulfur metabolism of dogs. *J. Biochem.* **93**:275-282, 1931.
162. Cerecedo, L. R. Studies on physiology of pyrimidines. VI. Fate of parabanic acid, alloxan, and alloxantin in organism of dog. *J. Biochem.* **93**:283-291, 1931.
163. Evans, E. A., Jr. Pyruvate oxidation and citric acid cycle. *Bull. Johns Hopkins Hosp.* **69**:225-239, 1941.
164. Suzuki, S. Adrenaline and insulin as factors causing variations in blood oxalic acid level. *Jap. J. M. Sc. II. Biochem.* **3**:23-31, 1935. Relation of oxalic acid to thyroid. *Ibid.* **3**:41-44, 1935.
165. Kamiya, S. Changes in blood oxalic acid during progressive asphyxiation. *Jap. J. M. Sc. II. Biochem.* **3**:301-303, 1937.
166. Fleuret, P. H. Influence de quelques substances sur le mécanisme de formation des acides B oxybutyrique et oxalique. *Compt. rend. Soc. de biol.* **118**:1569-1572, 1935.
167. Oikawa, S. Influence of muscular exercise on oxalic acid excretion in rabbit. *Jap. J. M. Sc. II. Biochem.* **4**:21-24, 1938.
168. Kamiya, S. On behaviour of oxalic acid in animal organisms especially in liver and muscle. *Jap. J. M. Sc. II. Biochem.* **3**:289-300, 1937.
169. Oikawa, S. Contribution to fate of oxalic acid in animal body. *Jap. J. M. Sc. II. Biochem.* **4**:45-58, 1938.
170. Orzechowski, G., Gomori, P., and Hundrieser, M. Das Schicksal verfutterter Oxalsäure im Organismus des Hundes. *Arch. Exper. Path. u. Pharmakol.* **178**:738-748, 1935.
171. Copley, A. L., and Lalich, J. J. Influence of blood transfusion and injections of Bursa pastoris (shepherd's purse) extract on clot resistance in 2 hemophiliacs. *Am. J. M. Sc.* **204**:665-670, 1942.
172. Schumann, E. A. Newer concepts of blood coagulation and control of hemorrhage. *Am. J. Obst. & Gynec.* **38**:1002-1007, 1939.
173. Milliken, L. F. Use of new blood coagulant in transurethral prostatic resection. *J. Urol.* **42**:75-77, 1939.
174. Martin, G. J. Mechanism of action of dicarboxylic acids in blood coagulation. *Am. J. Physiol.* **130**:574-581, 1940.
175. Page, R. C., Russell, H. K., and Rosenthal, R. L. Effect of oxalic acid intravenously on blood-coagulation time in 3 hemophiliacs. *Ann. Int. Med.* **14**:78-86, 1940.
176. Blain, A. W., and Campbell, K. N. Hemostatic effect of oxalic acid; clinical and experimental results, with review of literature. *Arch. Surg.* **44**:1117-1125, 1942.
177. Herbst, W. P., and Weinstein, J. J. Observations of action of Koagamin. *J. Urol.* **51**:325-328, 1944.
178. Hulse, W. F. Control of hemorrhage. *Arch. Otolaryng.* **37**:831-834, 1943.
179. Foster, R. H. K. On role of oxalic acid in blood clotting. *Proc. Soc. Exper. Biol. & Med.* **44**:136-139, 1940.
180. Johnson, J. B. Effect of oxalic acid given intravenously on coagulation time in hemophilia. *Proc. Soc. Exper. Biol. & Med.* **46**:496-499, 1941.

NEW HAMPSHIRE MEDICAL SOCIETY

PROCEEDINGS OF THE ONE HUNDRED AND FIFTY-FOURTH ANNIVERSARY

House of Delegates, May 14 and 15, 1945

THE House of Delegates convened at the Hotel Carpenter, Manchester, on May 14, 1945, at 7:30 p.m., with Speaker Ralph W. Tuttle presiding. The following members answered the roll call:

The President, *ex-officio*
The Secretary-Treasurer, *ex-officio*
Richard W. Robinson, Laconia
Francis J. C. Dube, Center Ossipee
W. J. Paul Dye, Wolfeboro
Walter H. Lacey, Keene
Walter F. Taylor, Keene
Arthur B. Sharples, Groveton
Ralph N. Jones, Whitefield
Leslie K. Sycamore, Hanover
Howard N. Kingsford, Hanover
Israel A. Dinerman, Canaan
George F. Dwinell, Manchester
Donald M. Clark, Peterborough
Stillman G. Davis, Nashua
Robert E. Biron, Manchester
Mildred Chamberlin, Concord
William P. Clough, Jr., New London
Gerard Gaudreault, Concord
Willard C. Montgomery, Epping
Harry B. Carpenter, Portsmouth
Robert W. Tower, Plaistow
George G. McGregor, Durham
Francis H. Nolin (alternate for Donald C. Moriarty, Newport)
B. Read Lewin, Claremont

The Speaker declared a quorum present. On motion duly made and seconded, it was voted to omit the reading of the previous minutes, because of the publication of the proceedings.

The Speaker appointed the Credentials Committee as follows: Drs. Clough, Jr., Biron and Dube. To the Committee on Officers' Reports, he appointed Drs. Robinson, Chamberlin and Lewin. To the Committee on Communications and Memorials, he appointed Drs. Davis, Handy and Dinerman. To the Committee on Nominations, he appointed Drs. Clark, Dye, Tower, Moriarty and Sharples. For the Committee on Credentials, Dr. Clough, Jr., reported that the credentials were in order.

The Secretary-Treasurer, Dr. Carleton R. Metcalf, presented his report, as follows:

Membership, December 31, 1944

PAID

Belknap County	26
Carroll County	13
Cheshire County	21
Coos County	25
Grafton County	57
Hillsborough County	98
Merrimack County	54
Rockingham County	49
Strafford County	29
Sullivan County	13
Not in County Society	3
	388

UNPAID

Affiliate members	23	
Honorary members	6	
Members in service	129	
		158
		546

The total membership on December 31, 1943, was 535.

Financial Statement

RECEIPTS

January 1, 1944 — balance forward	$268.42
Belknap County	156.00
Carroll County	60.00
Cheshire County	108.00
Coos County	127.00
Grafton County	372.00
Hillsborough County	618.00
Merrimack County	324.00
Rockingham County	312.00
Strafford County	174.00
Sullivan County	84.00
Net receipts, 1944 annual meeting	95.02
Cash received at annual meeting	56.00
Members not in county societies	18.00
Refund (Cancer Committee)	6.60
Bond cashed (Women's Auxiliary)	74.00
Women's Auxiliary	87.25
Donations to National Physicians' Committee	191.00
Full subscription to *New England Journal of Medicine*	3.00
Trustees	500.00
Blue Shield (Coos County)	100.00
	$3734.29

EXPENDITURES

New England Journal of Medicine:	
Journals	$489.10
Full subscription	3.00
Cuts	6.19
Tables	10.06
Carleton R. Metcalf:	
Salary	500.00
Reimbursement for room at annual meeting	4.20
Printing	64.25
Envelopes and stamps	40.59
Eagle and Phoenix Hotel Company (committee lunches)	65.85
Halftone cuts	40.02
Clerical work	150.00
Telephone and telegraph calls	58.81
Retaining fee	100.00
Guest speakers (fees)	22.20
Cancer Committee	50.00
Deering G. Smith:	
Expenses at American Medical Association meeting	189.60
Procurement and Assignment	259.85
Dues collected at annual meeting	56.00
Benevolence Fund:	
Women's Auxiliary	141.25
$1.00 per each paid member	343.00
National Physicians' Committee (donations)	
Belknap County	25.00
Coos County	25.00
Sullivan	14.00
Strafford	1.00
Merrimack County	50.00
Rockingham County	48.00
Madeline A. May (stenographer at annual meeting)	147.51
Blue Shield (Coos County)	100.00
Mechanics Bank (service charges)	2.77
Trustees:	
Incidentals	1.62
Accounting service	10.00
Refund on dues	13.00
Newspaper service (Blue Cross)	25.00
	$3056.87
Balance, January 1, 1945	677.42
	$3734.29

The total membership on December 31, 1944, was 546. This is an increase of eleven over the preceding year.

Louis W. Flanders, of Dover, who was elected president of the Society in June, 1924, has recently died. Frederic P. Scribner, of Manchester, for many years a valuable member of the Committee on Scientific Work, died on July 17, 1944.

At the request of the Trustees, the Benevolence Fund has been turned over to that body. For several years heretofore, while the Trustees have been the official custodians, the accumulation of this fund had been entrusted to the Secretary-Treasurer. In last year's report I stated: "This fund is to accumulate until it reaches $10,000. The interest from the fund may then be used to help needy members of the Society." This statement was incorrect; there are several hundred dollars in the Benevolence Fund that are now available. I misinterpreted Chapter 11, Section 3, of our by-laws, which reads as follows:

> When the total sum of the Benevolence Fund reaches ten thousand dollars ($10,000) the House of Delegates may increase or decrease the yearly allotment from the dues of each member to the fund, and it shall also decide whether the income from the general fund shall continue as a source of revenue to the Benevolence Fund.

It should be noted that the allotment from the dues may be changed when the total sum reaches $10,000. This statement implies, I suppose, that the allotment may not be changed before that time. As a matter of fact, two changes have been made, although the total sum has not yet been reached. A few years ago the amount of the annual assessment was doubled, and last year the House of Delegates voted to discontinue for one year further contributions to this fund from the annual dues. Such a vote was apparently not valid.

The proper course a year ago would have been to propose an amendment to this section of the by-laws at the first session of the House of Delegates and to vote on it at the second session, but if the intention of the House of Delegates has not been properly carried out and the customary contribution is made to the Benevolence Fund for the past year, it will merely mean robbing Peter to pay Paul, for we shall have to transfer money from the General Fund to the Benevolence Fund.

I suggest that Chapter 11, Section 3, be referred to the Committee on Amendments to the Constitution and By-laws, with the recommendation that it be modified or eliminated. If a change is voted it might be possible to make it retroactive for one year, so that the intention of the House of Delegates a year ago may be carried out. We must also decide about an assessment for the coming year.

While no money was added to the Benevolence Fund from the annual dues last year, we did receive donations from the following auxiliaries:

Hillsborough	$18.75
Merrimack	20.00
Strafford	48.50

A bond received from the State Auxiliary in 1943 was cashed, and the further sum of $74.00 was added to the fund in 1944.

In accordance with your instructions, $50.00 was given to the Cancer Committee for its work.

I asked each county society to have its members contribute $1.00 apiece to the National Physicians' Committee. During 1944, $191.00 was received from the several counties, as follows:

Belknap	$25.00
Coos	25.00
Merrimack	50.00
Rockingham	48.00
Sullivan	14.00
Strafford	29.00

In addition, the Hillsborough County Medical Society contributed $51.00, which was sent directly to the National Physicians' Committee.

A report on the New Hampshire Physician Service, or Blue Shield, which was inaugurated and sponsored by the House of Delegates, will be given by its president, Leslie K. Sycamore. A further report will be given by the Executive Secretary at the general meeting.

There has been no vital legislation in the General Court during its recent session. I was on hand at five or six committee meetings, usually as an onlooker, but, at the request of the State Board of Health, I spoke briefly on three occa-

sions as an individual, not as a representative of the New Hampshire Medical Society. The bills that were under discussion were:

A bill to transfer certain health work now done by the Labor Department to the Department on Public Health. The bill was approved by the Committee on Public Health of the Society.

A bill to eliminate the doctor of medicine from the Board of Optometry, thereby placing five optometrists on the board instead of four optometrists and a physician.

A bill to liberalize the use and the coloring of oleomargarine.

A bill to enrich flour and bread by the addition of the vitamins that are initially removed in the process of milling.

A bill to require that employes of restaurants and other eating places obtain a medical certificate annually stating that they are free from tuberculosis and venereal diseases.

An increased fee is now being allotted to physicians for the obstetric care of the wives of servicemen. Beginning September 28, 1944, this fee was raised to $50.00.

During the past year or two I have heard a statement made several times that the Society was being run by the "Old Guard." There is considerable truth in this statement, and I suggest that the Committee on Nominations scan the committee lists this year. While it may be desirable, because of their experience, to have members of the "Old Guard" in some of the key positions, it is likewise desirable to give younger men committee appointments so that they themselves will be familiar with the work of the Society when, a few years from now, they themselves become elder statesmen.

Of course, a good many of our younger men are in the armed services, but if it seems desirable, the Committee on Nominations ought to be able to make a start in the direction that I have suggested.

A modified Wagner Bill is in the making at Washington. I am told that it is the same old bill; the leopard has not changed his spots. Our two senators and our two congressmen are opposed to it. So far as I can find out, the doctors in the armed services are generally opposed to it and are fearful that something may be put over on them while they are absent.

Another group of planners in Washington is working out a new proposal for government-sponsored medical care.

The post-war project is being drafted by the United States Public Health Service and the Department of Agriculture's Postwar Planning Committee. It would spur a hospital building program such as the Nation has never seen. It would send thousands of doctors, dentists and nurses into rural areas and other places with little service, and it would provide compulsory health insurance.

The sponsors of the plan contend that there are many untended sick people in this country. They claim that in one third of the Nation's counties there is no hospital of any type and that thirty-three rural counties had no doctors at all even before physicians were called into the armed forces. They claim that another two hundred and forty-one counties had only one doctor for every two thousand people. The planners claim that the trouble is economic — that doctors go where there are concentrations of high-fee patients, and that the only solution is for the Government to step in.

Surgeon General Thomas Parran, head of the Public Health Service, declares, "The financing of a program for the total health care of the population must come through some system of prepayment, probably on an insurance basis, through public taxes or, perhaps, through a combination of both." Applied to the Nation, estimates indicate the cash involved each year in such a compulsory health scheme would be about $1,800,000,000. A doctor operating under this federal plan would be given his choice of three different methods of obtaining his income.

In addition to this health program, the plan calls for special new centers to administer and practice public health. Each metropolitan area would have one or more base hospitals, from which there would radiate a series of rural hospitals more limited in service. There is also planned a program of health centers, which would be field stations of the future system of public health and medical care. Mobile clinics are also proposed.

Senate Bill 191 is much more modest. It provides for hospitals and health centers under state supervision but does not regiment the doctors. This bill is sponsored by the American Hospital Association.

What are the members of the Society going to do if the Wagner Bill or some similar bill becomes law? Are we going to refuse to sign on the dotted line and try to practice medicine as we have heretofore practiced it, or are we going to become government doctors? Are we going to exhibit inertia, which is sometimes a property of mind as well as of matter?

We ought, individually, to give thought to this matter now. We ought to realize that changes in the method of practice are bound to come and that we ought to have a constructive hand in shaping such changes. We ought to take time by the forelock. Probably the best course is to accept wholeheartedly the leadership of the American Medical Association. We ought, at any rate, to hang together, for, as a wise old philosopher once said, "We must all hang together, or assuredly we shall all hang separately."

The Secretary-Treasurer then presented a letter from Elmer V. Andrews, Commissioner of the Department of Public Welfare, reading as follows:

> At the spring meeting of the Medical Advisory Committee of Ophthalmologists, which was held May 2, 1945, at the Eagle Hotel, Concord, the committee voted to invite Thomas F. Reid, M.D., of Dover, to become a member of this committee.
>
> In order that the records may be kept up to date and the Society may be kept informed on all departmental matters relating to the medical care field, I am writing to request that the House of Delegates approve Dr. Reid's acceptance of an appointment to this committee.

Dr. Metcalf explained that Dr. Reid was to meet with this committee three or four times a year, and consult with them as to the care of the eyes. In this way, the Society would be giving its sanction for the ophthalmologists on the committee. He requested that the Speaker entertain a motion to approve Dr. Reid's appointment. Such a motion was made by Dr. Dye, and was duly seconded and was carried.

Dr. Metcalf then outlined a letter from Helen Hinman, nutrition consultant in the State Board of Health. She wished to have a committee to help her in the nutrition of the children of the State. She had selected three men, who had agreed to serve in an advisory capacity. These men were Drs. Colin C. Stewart, of Hanover, Brockway D. Roberts, of Durham (chairman); and Simon Stone, of Manchester. On Dr. Metcalf's suggestion, it was moved and seconded that they be appointed as a Committee on Consultation in Nutrition.

Dr. Robinson, speaking on the motion, said that although he had no objection to the appointment, he objected to the precedent it would establish of permitting persons outside the Society to dictate or determine one of its committees. Dr. Metcalf replied that he had dictated the committee to a certain extent, since he had asked Miss Hinman to give him the names of the men she wanted, promising to submit them to the House of Delegates. She apparently wanted to have people who were familiar with nutrition, were interested in it, and would be willing to serve. Dr. Robinson then withdrew his objection, and the motion was duly carried.

Dr. Metcalf next presented a financial report from the Trustees for January 1, 1943, to December 31, 1944, as follows:

RECEIPTS

Interest on various deposits	$782.12
Interest on United States Bonds, Series G, other than those in the Benevolence Fund	456.25
Contributions to the Benevolence Fund	913.25
Total	$2,151.62

EXPENDITURES

Expenses of the Society as voted	$1,859.66
Burnham prizes	150.00
Total	$2,009.66

DEPOSITS

General Fund:	
New Hampshire Savings Bank	$3,152.98
Portsmouth Trust & Guarantee Company	1,223.90
Nashua Trust Company	398.23
United States Defense Bonds, Series G	3,000.00
Total	$7,775.11
Bartlett Fund:	
Portsmouth Savings Bank ($352,11 of this is a permanent fund, the income to be "expended only for the benefit of medical science, as may be directed by vote of this Society")	2,998.92
United States Defense Bonds, Series G	2,000.00
Total	$4,998.92
Pray Fund:	
Strafford Savings Bank ($1000.00 of this is a permanent fund, the income to be expended only for prize essays)	291.08
United States Defense Bonds, Series G	1,000.00
Total	$1,291.08
Burnham Fund:	
New Hampshire Savings Bank ($1,140.00 of this is a permanent fund, the income to be expended only for prize essays)	1,064.01
United States Defense Bonds, Series G	1,000.00
Total	$2,064.01
Benevolence Fund:	
New Hampshire Savings Bank ($688.87 of this is accrued income available for the purposes of the fund)	3,239.81
United States Defense Bonds, Series G	3,000.00
Total	$6,239.81

Dr. Robinson moved the acceptance of this report, and the motion was duly seconded and was carried.

Dr. Robinson for the Committee on Officers' Reports then spoke as follows:

> This Committee believes that it voices the general opinion of the members of our society in expressing respect for the diligent efforts and gratification for the accomplishments of the Secretary-Treasurer. We note with sorrow the deaths of two former officers of this society. We move the approval of this portion of our report.

This motion was duly seconded and was carried.

Dr. Robinson then spoke as follows:

> Regarding the predicament that has arisen from alterations in the allocation of dues to the Benevolence Fund, we suggest that the Benevolence Fund return to the General Fund the amount it has received in excess of that designated in the by-laws after deducting the amount of the assessment that it should have received last year, had not such assessment been illegally withheld. We likewise suggest that the by-laws be amended to permit suspension of such assessments by unanimous vote of the House of Delegates at a regular meeting for the period of one year. To accomplish this, we move that Chapter XI, Section 3, of the by-laws be amended to read as follows:
>
> When the total sum of the Benevolence Fund reaches ten thousand dollars ($10,000), the House of Delegates may increase or decrease the yearly allotment from the dues of each member to the fund, and it shall also decide whether the income from the General Fund shall continue as a source of revenue to the Benevolence Fund; except that at the time of any regular meeting of the House of Delegates, the yearly allotment may be abolished, increased or reduced, for a period of one year only, by unanimous vote of the members assembled.
>
> We move the adoption of this portion of our report, and that the proposed amendment to the by-laws be turned over to the Committee on Amendments to the Constitution and By-laws.
>
> The reason we make the suggestion that the Benevolence Fund return to the General Fund the amount it has received and take out money that should have been assessed last year is that we see no way of taking retroactive care of the fund.

The Speaker asked whether this proposal should not be made on Amendments to the Constitution and By-laws. Dr. Robinson said that it had been recommended to that committee.

Dr. Wilkins said that the original purpose was to build up a fund of $10,000. The fund was started in 1932, and since there was at one time plenty of money, the rate was increased from 50 cents per member to $1.00. Last year, the assessment was entirely suspended, because of the decrease of funds due to members' being in the Service. He added that he had no objection to the proposed amendment, but that it would simply slow up the reaching of the final goal.

Dr. Robinson expressed his willingness to yield any proposal to the Committee on Amendments to the Constitution and By-laws, but said he did not believe that a by-law could be abolished or suspended and then legalized a year later. He added that the by-law must be changed as of a particular time, and that it could not be changed as of last year now.

Dr. Kingsford thought that the Trustees intended the Benevolence Fund to be allowed to reach $10,000, and then to be used in whatever way the House of Delegates desired. As he understood it, if the new motion went through, money could occasionally be taken out of the fund before it got to be $10,000.

Dr. Dye asked whether the General Fund would have been faced with a deficit if the assessment had not been suspended last year. Dr. Metcalf answered in the affirmative.

Dr. Dube suggested simply increasing the dues. Dr. Robinson then spoke as follows:

As I understand it, several years ago, contrary to the by-laws, an allotment to the Benevolence Fund was increased. Last year, it was voted not to allocate the fund at all. Whatever is done must take care of the two circumstances. The best procedure, it seems to me, is to devise a simple arrangement of bookkeeping that requires no amendment, and to pass a simple amendment permitting the House of Delegates, by unanimous vote, to set the assessment aside for one year. This could be repeated as often as desired, and increased or decreased on the same basis. It is easy to refer this matter to the Committee on Amendments to the Constitution and By-laws, but it does not take care of the past changes and allocations.

The speaker pointed out that the by-laws could not be changed at one session and that any amendment proposed would have to be laid on the table until the following morning's meeting. He then put the original motion to vote, and it was carried.

Dr. Robinson for the Committee on Officers' Reports said that it approved the policy of transfusing the offices and committees with new and younger blood, so that more of the members would be able to derive the benefits of service performed to the Society. It did not believe that new blood, properly typed, was so apt to cause reactions as would repeated usage of blood from the same donors. He moved the acceptance of this portion of the report, and the motion was duly seconded and was carried.

Dr. Robinson then spoke on the questions propounded in the Secretary's report respecting individual attitudes to proposed federal legislation concerning the distribution of medical care. He said that various aspects of this subject had been touched on in the report of the delegate to the American Medical Association and in the report of the Committee on Medical Economics. It was the committee's best judgment that physicians should make up their minds that they will have no part in any plan that in one iota reduces the freedom of American medicine, but should hold themselves ready to co-operate constructively toward possible plans of the future that may promise better distribution of adequate medical care, provided they can be freed of this and other important evils. As Dr. Metcalf had said, the Society could do no better than to follow the lead of the American Medical Association in these matters. He moved the acceptance of this portion of the report, and the motion was duly seconded and carried.

Dr. Lawrence then spoke as follows:

The House of Delegates of the American Medical Association is made up exactly like the Society's House of Delegates. The delegates to the former come from the various states, and those to the latter from the counties. After all, the county is the autonomous body, and not the American Medical Association or the state association. So that ideas of this kind, with regard to program or planning, can really best originate in the autonomous body and can be passed on from there. Inasmuch as we, as autonomous bodies, are represented by delegates elected by them, those delegates should be instructed. In other words, it is one thing to say that we take the leadership of an organization that we think is, in a sense, other than ourselves, and another thing to take a leadership in which we take an active part in regard to the future of medicine at the present time. It seems to me that the future is best going to be served when every one of us takes his part in planning for the future and not asking someone to do it for him.

Dr. Dye then presented the following report.

Report of the Committee on Amendments to the Constitution and By-laws

The majority of so-called "affiliate" members of the New Hampshire Medical Society are those physicians who have been members of this society for a continuous term of fifteen years and are either not less than sixty-five years of age or totally disabled, and who have been given such membership classification at the request of their county societies by a majority vote of the House of Delegates. Largely for this reason, many physicians throughout the State and the Merrimac County Medical Society, by direct unanimous vote, have suggested that the term "affiliate" shall be changed to the term "life," throughout the constitution and by-laws. This committee therefore recommends that the following changes be made in the constitution and by-laws:

The Constitution:

Article 4, Section 1: This society shall consist of members, life members and honorary members.

Article 4, Section 3: Life members shall be those members whose dues are remitted.

The By-laws:

Chapter 1, Section 5: Any physician who has been a member of this society for a continuous term of fifteen years, and is either not less than sixty-five years of age or totally disabled, on the request of his county society may be made a life member on a majority vote of the House of Delegates. Life members shall have the same rights and privileges as other members of the Society, but shall not be required to pay dues.

Chapter 3, Section 1: The general meetings shall include all registered members, life members, honorary members and guests, who shall have equal rights to participate in the proceedings and discussions, and, except guests and honorary members, to vote on pending questions. Each general meeting shall be presided over by the president, or in his absence or disability, or by his request, by the vice-president. Before it, at such time and place as may have been arranged, shall be delivered the annual address of the president and the annual oration, and the entire time of the session so far as may be shall be devoted to papers and discussions relating to scientific medicine.

W. J. Paul Dye, *Chairman*
Frederick S. Gray
Ralph N. Jones

Dr. Robinson said that the Committee on Officers' Reports approved the changes as outlined in the report of the committee, and moved that the constitution and by-laws be so altered, subject to constitutional procedure. The Speaker directed that the matter be postponed until the morning meeting.

Dr. Amsden then presented the following report:

Report of the Necrologist

Name	Address	Date of Death
Bergeron, Pierre	Manchester	May 7, 1944
Flanders, Louis W.	Dover	January 16, 1945
Grimes, Warren P.	Hillsborough	November 13, 1944

Hawkins, Frederick L.	Meredith	November 8, 1944
Landman, Elbert A.	Plaistow	October 18, 1944
Normandin, Armand	Laconia	February 14, 1945
Ober, Charles F.	Manchester	January 29, 1945
Sargent, Frank H.	Pittsfield	July 11, 1944
Scribner, Frederick P.	Manchester	July 17, 1944

HENRY H. AMSDEN, *Necrologist*

Dr. Robinson for the Committee on Officers' Reports recommends the acceptance of this report, and in recognition of the service given by the departed members to the Society, suggested that the House rise and honor their names with a minute of silence. This was done.

Dr. Stewart then presented the following report:

Report of the Committee on Child Health

War conditions have again precluded much activity on the part of this committee. We expect shortly to send out a letter summarizing the most recent views on prophylaxis against the infectious diseases of childhood. This would include the use of gamma globulin as protection against measles, this material having recently become available through the State Department of Health.

Safeguarding the health of children in foster homes is another subject that has been considered. Protection against possible exposure to tuberculosis, along the lines discussed with Dr. Kerr, has been urged.

We have reviewed adoption practices in New Hampshire. Many doctors do not know the aids available to them in this field, and we have co-operated with the Children's Aid Society in the preparation of literature designed to bring this information to them. Your chairman appeared at a legislative hearing relative to proposed changes in the law concerning adoption.

COLIN C. STEWART, *Chairman*
B. READ LEWIN
FRANKLIN ROGERS

Dr. Robinson for the Committee on Officers' Reports approved the report and moved its acceptance. The motion was duly seconded and carried.

Dr. Wilkins then presented the following report:

Report of the Committee on the Control of Cancer

Two years ago the State Executive Committee of the Field Army of the American Cancer Society offered financial aid to physicians connected with the state cancer clinics for refresher courses at various cancer centers in New York City and Boston. Only six physicians have availed themselves of this privilege, but each of these has expressed deep appreciation of the clinical privileges afforded him in these centers. It is now suggested that plans be made during the coming year for one or two days' intensive instruction in the diagnosis and treatment of cancer, the course to be open to general practitioners as well as to those especially interested in cancer treatment. These plans will be elaborated further and communications regarding them will be sent to every member of the Society. It is anticipated that the expenses of attending this course will be borne by the Field Army of the American Cancer Society. The Executive Committee of the Field Army would like the approval of this society for this plan.

The Field Army has conducted its usual drive for members during April, and it is to be noted that the change in name from "Women's Field Army" to "Field Army" was made in order to encourage the enlistment of men as well as women interested in cancer control. The Field Army has continued its program of lay education and preparation of dressings for indigent cancer patients, and has provided transportation for patients to clinics and hospitals. This year educational material for cancer education has been furnished the high-school science classes in both public and parochial schools in Manchester, and it is to be hoped that such instruction will be introduced into the high schools of all communities in the State.

The New Hampshire Cancer Commission clinics have functioned as usual. The total number of visits to the clinics was 1582. Of these, 705 were made by new patients and 877 were return visits. Of the new patients, 61 per cent had cancer, this percentage having gradually risen from 36 per cent in 1934. During the last fiscal year the Commission paid for 4338 hospital days for patients unable to finance their own hospital expenses. In comparison with most other states, New Hampshire is fortunate in the facilities for cancer diagnosis and treatment made available by the Cancer Commission.

Your committee has sent three communications to all physicians within the State. The first was a pamphlet containing two articles, "The Doctor's Responsibility" and "The Office Detection of Cancer." Under both these subjects were discussed points that had been stressed before in previous letters, all of them important in relation to cancer diagnosis. The second was a letter explaining the difference between carcinoma simplex and adenocarcinoma, about which there had been confusion in the minds of some physicians after receiving pathological reports of tumors or biopsies. It stated that carcinoma simplex is usually more malignant and more invasive than adenocarcinoma and metastasizes more rapidly. The third was a letter reiterating the need of not overlooking the importance of any abnormal rectal or vaginal bleeding, the necessity of recognizing the fact that such bleeding is usually due to pathologic change and the need for investigation until the cause is discovered. Mention was also made that after the menopause, estrogenic therapy may cause flowing similar to that resulting from adenocarcinoma of the fundus. In rectal bleeding, physicians were reminded again of the proper sequence of methods to determine the cause, in the order named: digital examination, proctoscopy and x-ray examination — not the reverse.

Of the $50.00 appropriated for the use of the committee, there was spent $31.20 for stationery, postage and printing. A check for the balance of $18.80 has been sent to the Treasurer, the large balance being due to fewer physicians on the mailing list. The committee requests $40.00 for the ensuing year.

GEORGE C. WILKINS, *Chairman*
RALPH E. MILLER
GEORGE F. DWINELL, *Secretary*

Dr. Robinson for the Committee on Officers' Reports commended highly the diligent efforts of the Committee on the Control of Cancer, and said that the Committee was confident of a continuation of the same effort in the future. He recommended that the request for $40.00 to carry on its activities be granted. The committee, he continued, took recognition of the fact that early diagnosis is the best present answer to a lower mortality from this disease, and wished to go on record as approving the suggested plan for intensive instruction in the diagnosis and treatment of cancer as outlined in the report. He moved its approval, and also moved that the State Executive Committee of the Field Army of the American Cancer Society be given notice of such action on the part of the House of Delegates. This motion was duly seconded and carried.

Dr. Blood then presented the following report:

Report of the Committee on Maternity and Infancy

This is the eleventh year of this study of maternal and infant deaths.

Maternal Mortality

There were 26 maternal deaths and 8695 live births, a maternal mortality rate of 2.99 per 1000 live births. This may be compared with the figures for 1943 of 24 maternal deaths and 9825 live births, a maternal mortality rate of 2.44 per 1000 live births. Over a period of ten years, the highest mortality was that of 1935, 6.1 per 1000 live births, with 45 deaths; the lowest was that of 1942, 1.6, with 15 deaths.

The 26 maternal deaths have been classified according to the *International List of Causes of Death*, as follows:

Classification	No. of Deaths
Puerperal toxemia (death after delivery)	9
Infection during childbirth and puerperium	7
Accidents of pregnancy (death before delivery)	5
Inversion of uterus	2
Hemorrhage (1 before delivery and 1 after)	2
Ectopic gestation	1
Total	26

The committee has reclassified these for the purpose of this report in the following way:

Cause of Death		
Accidents of pregnancy		11
Puerperal emboli	4	
Anesthesia	2	
Inversion of uterus (with hemorrhage)	2	
Attempted abortion with poison	1	
Cerebral embolus (before delivery, cause unknown)	1	
Multiple pulmonary emboli due to meconium and amniotic fluid (before delivery)	1	
Hemorrhage		2
Internal hemorrhage	1	
Probable placenta previa (case seen only by coroner)	1	
Toxemia (all types)		9
Puerperal sepsis		3
Ruptured ectopic pregnancy		1
Total		26

The committee has further classified these cases on the basis of data submitted in one of three groups: unavoidable, patient's fault and probably avoidable. There were reports on 5 deaths that gave insufficient data for classification. In 2 of these, one eclampsia and the other puerperal infection, no information was submitted. The other 3 deaths were recorded on the certificate as due to postpartum eclampsia, eclampsia and internal hemorrhage, respectively. The remaining 21 cases were classified as follows: unavoidable, 11; patient's fault, 6; avoidable, 4. Of the 11 deaths classified as unavoidable, 6 were due to embolism, 2 to inversion of the uterus, 2 to toxemia and 1 to ectopic gestation. Of the 6 deaths classified as the patient's fault, — that is, she failed to seek medical attention or failed to carry out medical advice, — 3 were due to toxemia and 1 to hemorrhage, probably placenta previa; in 1 case the actual cause of death was pneumonia following a normal delivery when the patient left the hospital against advice; and in 1 case death was due to poison from drinking oil of cedar in an attempt to abort. Of the 4 deaths classified as probably avoidable, 2 were due to anesthesia. The committee is of the opinion that, with the difficulty at the present in securing physicians to give anesthesia, the attending physician must assume the responsibility for it and be more careful and attentive to the procedure. There was 1 death due to toxemia that the committee thought might have been avoided had adequate treatment been given. One patient died of postoperative complications following a cesarean section. In this case some of the committee believed that the procedure of choice would have been to allow the patient to deliver normally.

All the deliveries took place in a hospital.

The deaths by county were as follows: Belknap, 2; Carroll, 1; Cheshire, 1; Grafton, 2; Hillsborough, 8; Merrimac, 2; Rockingham, 3; Strafford, 6; and Sullivan, 1. Coos County is the only one having no maternal deaths.

The committee has certain recommendations to make, and these will appear later in detail in a printed report, copies of which will be sent to each member. Briefly the points are as follows:

The value of Rh-factor typing in obstetric patients and having facilities available for typing in hospital laboratories.

The value of autopsies, with an increasing effort on the part of physicians to obtain an autopsy.

The increased responsibility of the attending physician in giving patients in labor an anesthetic.

The treatment in toxemias. (There is evidence that physicians still fail to give adequate and proper treatment in toxemias. Toxemia is still highest on the list as a cause of maternal deaths. The treatment in toxemias cannot be overstressed.)

Infant Mortality

Included in this group are those infants who died under one year of age. There were 322 infant deaths in 1944, giving an infant death rate of 37.0 per 1000 live births, as compared with 420 deaths in 1943, a rate of 42.9. Prematurity as a single cause still accounts for the largest number of deaths.

Stillbirths

There were 232 stillbirths in 1944, as compared with 211 in 1943. The cause for the most part is reported unknown.

Robert O. Blood, *Chairman*
Benjamin P. Burpee
Marion Fairfield

Dr. Robinson expressed the sincere recognition of the Committee on Officers' Reports of the invaluable service rendered to the welfare of the State by the Committee on Maternity and Infancy. He said it believed that this committee renders likewise an invaluable service to every conscientious physician practicing obstetrics, both in New Hampshire and throughout the civilized world. Such statistical reports, carefully analyzed, he continued, should serve as the most solid available foundation on which physicians can build for the betterment of methods of obstetric care. He therefore urged every member of the Society to give this committee his fullest co-operation as the occasion may arise, scientifically and without prejudice. He moved the acceptance of this report, and the motion was duly seconded and carried.

Dr. Sycamore then presented the following report:

Report of the Committee on Medical Economics

New Hampshire Physician Service. The past year has seen the fruition of the project toward which your committee had directed the major portion of its labors in the preceding three years, ably assisted by the officers of the Society and the House of Delegates. On August 1, 1944, the New Hampshire Physician Service issued its first contracts, and since then has proved to be a lusty offspring, on which this committee has kept a paternal eye; although, of course, with the completion of incorporation, control and authority passed to the hands of the Board of Trustees of the New Hampshire Physician Service. An account of the operations of the plan to date is given in the report of its president.

Your committee has noted with interest the endorsement of medical-service plans given by the American Medical Association and the National Physicians' Com-

mittee. At the annual meeting of the American Medical Association last June, the report of the Committee on Medical Service and Public Relations, later accepted by the House of Delegates, stated: "All constituent state associations have been urged to develop voluntary plans [for medical expense insurance] within their territory. The American Medical Association will assist in the development, correlation and integration of such plans." It is evident, therefore, that the New Hampshire Medical Society, in constituting the New Hampshire Physician Service, has acted in accordance with the considered judgment of our national association.

National Physicians' Committee. The National Physicians' Committee has directed its efforts in the past year first to conducting a public opinion poll that indicated a preference for voluntary sickness insurance over national compulsory insurance, and second, to promoting a campaign for the extension of such voluntary insurance of any type. Because some members of our society have expressed a certain degree of doubt as to the validity of the publicity and methods of the National Physicians' Committee, your committee recommends, as it did last year, that the question of financial support for this organization be left to each physician.

Association of American Physicians and Surgeons. A new organization has entered the field of medical economics and public relations, originally organized under the above name by the Lake County (Indiana) Medical Society and now claiming membership in all states, with endorsement by several county societies. The main purpose of the association appears to be an unalterable antagonism to any form of a governmental national health program, using as a weapon a professional boycott against any such program and against any fellow physicians who might co-operate with the program. Your committee recognizes the right of physicians to so organize; however, it is our belief that it is not expedient to approve so completely a closed-minded attitude as this organization insists on, for reasons that we think will become evident in the discussion of national compulsory sickness insurance. We also find it difficult to justify, on the basis of this organization's acknowledged activities, the annual dues of $10.00 necessary to continuing membership therein.

National compulsory sickness insurance. It is expected that a modified version of the Wagner–Murray–Dingell Bill will be introduced into the present Congress, undoubtedly incorporating some of the proposals advanced by the present Pepper Committee on Wartime Health and Education. Your committee believes that we should make no blanket condemnation before the fact, but should be prepared to make a careful evaluation of any such bill on its merits. We believe, furthermore, that governmental participation in the economic aspects of medical service may conceivably become expedient and desirable. There is merit, for example, in the regional organization of hospitals and health centers, with government assistance in providing the necessary facilities. Under such a plan the smaller diagnostic health centers and hospitals are integrated with progressively larger units, so that necessary consulting and special services are readily available to all. A logical extension of such regional organization is the development of group practice around the hospitals. The medical profession, we believe, will contribute more to its own and the public welfare by indicating its readiness to confer with governmental agencies in an attempt to work out a mutually satisfactory solution than by assuming an uncompromising antagonism to any such attempt. We would point out that the existence in New Hampshire of a strong and widely inclusive voluntary prepaid-medical-care program under the auspices of the New Hampshire Medical Society would be a cogent argument, in any discussion, for the capability of the medical profession in our state to handle the professional aspects of medical care, and we therefore bespeak the vigorous support of all members of the Society for the New Hampshire Physicians Service.

L. K. Sycamore, *Chairman*
Francis J. C. Dube
R. W. Robinson

Dr. Robinson said that the Committee on Officers' Reports had no special comment to make on the above report. For himself and the members of his committee, he approved each part of it, except that he detected a feeling, not quite unanimous, that it indicated a little too much willingness to participate in plans of the federal government for socialized medicine. He was willing to defend the report, but had no other to make.

Dr. Dube moved the acceptance of the report, and his motion was duly seconded and carried.

Dr. Bowler then presented the following report:

Report of the Committee on Medical Education and Hospitals

The activities of this committee during the past year have been extremely limited, owing to conditions at this time that have permitted no program of post-graduate study. The Commonwealth Fund fellowships have been discontinued for the duration of the war.

The Speakers' Bureau has been used by a few county societies, but this program has necessarily been restricted as well.

The New England Regional Committee of the Wartime Graduate Medical Program has continued in operation, and on it this committee has been represented. The services of several men in the Society have been utilized in connection with this program in lectures and demonstrations at various station hospitals in this region.

Quite recently a commission has been named by Governor Charles M. Dale for the survey of hospital facilities in New Hampshire. The appointment of this committee follows the outline of Senate Resolution No. 191, a bill providing for a national survey of hospitalization facilities, to be on a state basis. This commission is representative of various groups interested and concerned in the general problem of health and hospitalization, and to it have been appointed Dr. George C. Wilkins, of Manchester, and the chairman of this committee. It is entirely possible that out of this survey may develop more activities on the part of this committee.

John P. Bowler, *Chairman*
James W. Jameson
Herbert L. Taylor

Dr. Robinson moved the adoption of this report. The motion was duly seconded and carried.

Dr. Powers then presented the following report:

Report of the Committee on Public Health

This is the third anniversary of the Committee on Public Health. For the past year the Committee has consisted of Dr. Anthony E. Peters, of Portsmouth, Dr. Clinton R. Mullins, of Concord, and Dr. Harris E. Powers, of Manchester, the latter serving as chairman. It has been the function of this committee to keep in touch with the public-health activities in our state, and to keep abreast of the functions of other public-health units in the scattered sections of the country. This has been accomplished by communications from the Committee on Public Health of the American Medical Association and by direct contact with the workers in our own community.

Again this past year our industries have been pressed hard in securing employees, owing to the urgency of the war demands. In many instances we have had to resort to older men, and men who are less well physically qualified for the arduous duties they have had to carry on. Both employer and employee have labored under extenuating circumstances, tension has been high, and with these facts

in mind it is not unreasonable to presume that differences of opinion between labor and management might occur frequently. In our state, however, co-operation appears to have been excellent, and only minor instances have occurred to delay the war effort. Part of the credit for this is due to the progress of industrial health within the state boundaries. The State Board of Health, with a limited group of employees, has made repeated inspections of industrial sites and offered its assistance in maintaining the highest possible working standards. Its co-operation has been accepted, and in most instances the progress of industrial health in New Hampshire has been moving steadily forward. Our problems have not all been solved, but we are making progress.

As an illustration, the chairman of this committee had the privilege in August, 1944, of making a tour of inspection of the northern section of the State, together with Dr. Alfred Frechette, State Health Officer, and Captain Forrest Bumford, acting director of the Division of Industrial Hygiene. This trip was made primarily for the purpose of gaining firsthand knowledge of how the State Board of Health functions, especially in the field of industrial hygiene. The trip took us through the north country, where we inspected the Brown Manufacturing Company at Berlin. It was indeed a surprise to go over the holdings of this company and learn something of how the lumber industry functions. We followed the process from breakfast to supper, starting out with the men and watching their activities throughout the day. We had the opportunity of going through the quarters of the lumberjacks, inspecting the mess shacks and examining the refrigeration plants. Dr. Samuelson, who serves as the medical director of the company, acted as our guide and escorted us through several of the camp sites. He took us through the infirmary and advised us of the care the employees were given in both sickness and injury. In the pulp mills, where a large number of chemicals are used in the processing of lumber, I learned that injurious gases are constantly given off and that unless precautions are taken the health of the employees may be seriously impaired. I watched the study of such problems through chemical tests taken over a period of twenty-four hours under actual working conditions and was interested in the methods suggested by the State Board of Health for overcoming these hazards.

Complicated surveys of similar character are constantly being made by the State Board of Health to increase the efficiency of employees by improving sanitary conditions under which they work. One does not have to go back many years to find a time when such activities would have been considered extravagant and unnecessary, but the profession is fast becoming conscious of the necessity of preserving the health of labor and the safety of the citizens.

This brings up another extremely important problem that must sooner or later be faced; very little has been done in the resort sections of the State to ensure proper health standards among vacationists, and as the tourist trade grows and overnight camp and trailer sites increase in number, sanitary conditions about these areas are certainly going to demand more direct supervision.

The Society owes a debt of gratitude to the State Board of Health, which at the present time is functioning with a limited personnel and under somewhat trying circumstances owing to the lack of suitable housing facilities. The various departments are scattered among several buildings, and co-ordination under such an arrangement is difficult. Our moral support for suitable housing facilities for the State Board of Health as a unit will aid materially in obtaining such quarters and will improve the efficiency of the department. Public health is primarily a medical problem, and it is our duty as physicians to keep it that way.

It has been a pleasure and privilege to serve as your representatives on this committee for the past year.

HARRIS E. POWERS, *Chairman*
ANTHONY E. PETERS
CLINTON R. MULLINS

Dr. Robinson said that the Committee on Officers' Reports found much of interest in the report of the Committee on Public Health. It recommended commendation of the State Board of Health of its efficient performances, especially in the cause of industrial hygiene, by the House of Delegates. The committee suggested that the House go on record as approving, when betterment of personnel makes it practicable, more rigid sanitary protection for the users of recreational facilities. He moved the acceptance of this portion of the report. This motion was duly seconded and carried.

Dr. Robinson likewise moved that the House of Delegates go on record as being in favor of more efficient housing of the State Board of Health than is now employed. He moved the acceptance of this portion of the report, and the motion was duly seconded and carried.

Dr. Smith then presented the following report:

Report of the Delegates to the House of Delegates, American Medical Association

The annual session of the House of Delegates of the American Medical Association was held at Chicago in June, 1944. It was well attended, especially by the doctors in the services. Your delegate served as chairman of the Reference Committee on Credentials. Emphasis throughout the meetings was on the war and subjects allied to it.

The Committee on Postwar Medical Service, appointed to assist veterans in location and post-graduate work, reported that questionnaires had been sent to all medical officers asking them what they wanted after the war as refresher courses, internships, residencies and so forth. Plans should be made to assist the veterans in obtaining this post-graduate work and in their relocation. Accordingly, it is recommended that this society establish a Committee on Postwar Medical Service, to work with the similar committee of the American Medical Association. The establishment of a loan fund by the Society, to be administered by this committee or by the trustees, or both, should be considered. Loans to returning medical officers may prove of material assistance in re-establishing themselves in their practice.

The general program of Emergency Maternal and Infant Care was approved, but the methods of payment were disapproved. It was recommended that the program be transferred from the Department of Labor to the Department of Public Health, and that full control and regulation of it be placed completely in the public-health department of each state.

The Council on Medical Service and Public Relations has established a Washington office. It has studied proposed legislation, voluntary insurance diagnostic clinics and medical-service bureaus, and has collected information and data concerning all aspects of medical care. Bulletins of the activities of the council have been sent to the county and state societies, and the information collected is available to all.

Dr. Kretschmer suggested that the family physician should take a more active part in the education of the public in social medical questions. "It would be well," he said, "if every member of the profession would make a personal effort to explain to patients, whenever the opportunity offers or can be made, the problems with which medicine is faced, and particularly the results of governmental dictation and supervision of medical practice."

New England was honored by the election of Roger I. Lee, of Boston, as president-elect of the Association. The 1945 session has been canceled, although it is expected that the House of Delegates will meet in Chicago in the fall. Extensive plans are in preparation for the one hundredth anniversary of the American Medical Association in 1947. It is hoped that either the war will be over or conditions will have so changed that a proper celebration may be held at Atlantic City.

An effort has been made in this report to bring to your attention some of the high lights of the meeting. The complete proceedings have been published as usual in the *Journal of the American Medical Association.*

DEERING G. SMITH

Dr. Robinson for the Committee on Officers' Reports paid tribute to the ability and excellent service rendered to the state and national societies by Dr. Smith. He moved the acceptance of this portion of the report, and the motion was duly seconded and carried.

Dr. Robinson then spoke as follows:

Regarding the creation, on the part of the New Hampshire Medical Society, of a loan fund as an aid to the re-establishment within the State of physicians returning from service in the armed forces, we, of course, are in complete approval of the sentiment that fathers this idea, but believe that the size of such a fund as might be raised within our abilities would bear little practical significance when compared with the size of the service that it was fostered to perform, thag its actual benefit would be small and that the potentialities toward the production of ill-feeling might be large.

We believe that it is intended that such funds be made available as a part of postwar nation-wide planning and, if not, that local banking facilities will be readily available to physicians for such purposes, as they have in the past.

We think that the Society should approve the appointment of a Committee on Postwar Medical Service to co-operate with the similar committee of the American Medical Association. We suggest that this committee be appointed by the chair, and not be elective. We recommend that it have a member from each county in the State, and that one of these be a member of the Committee on Medical Preparedness and another a member of the Committee on Medical Education and Hospitals. We believe, likewise, that each appointee should have the ratification of his own county society. We move the acceptance of this portion of our report.

This motion was duly seconded and carried.

Dr. Robinson then said:

We approve the transference of the program of Emergency Maternal and Infant Care from the Department of Labor to the Department of Public Health, and the proposal that the full control and regulation of this plan in the State of New Hampshire shall remain completely in our own State Board of Health. We believe that the value of public education on social medical questions by individual physicians to their individual patients cannot be overemphasized, and recommend that the words of Dr. Kretschmer, as quoted in our delegate's report, be read at the General Assembly. We move the acceptance of this portion of our report.

This motion was duly seconded and carried.

(To be concluded)

CASE RECORDS OF THE MASSACHUSETTS GENERAL HOSPITAL

Weekly Clinicopathological Exercises

FOUNDED BY RICHARD C. CABOT

TRACY B. MALLORY, M.D., *Editor**

BENJAMIN CASTLEMAN, M.D., *Acting Editor*

EDITH E. PARRIS, *Assistant Editor*

CASE 31341

PRESENTATION OF CASE

A forty-three-year-old woman entered the hospital complaining of dysphagia.

Six weeks before admission, while eating, she was seized with a sudden, severe lower substernal pain radiating to the right scapular region. For several days she felt generally miserable. The pain slowly subsided, but thereafter she found that ingestion of food brought on a similar attack, and she therefore did not partake of any solid food. She had no difficulty with fluids. There was no nausea or vomiting. The pain usually lasted one or two hours. On one occasion it persisted all night and the patient could not lie down.

She had had an attack of "pleurisy" four years before entry and again three years later. One sister had died of pulmonary tuberculosis.

Physical examination revealed a well developed, well nourished woman in no acute distress. There was deafness in the left ear, and a diaphragm that seemed to be high on the right. The feet were cold and clammy, and the dorsalis pedis arteries were not palpable. Otherwise, the examination was negative.

The temperature was 99°F., the pulse 70, and the respirations 20. The blood pressure was 125 systolic, 85 diastolic.

Examination of the blood showed a white-cell count of 8200, with 69 per cent neutrophils, 23 per cent lymphocytes, 7 per cent monocytes and 1 per cent eosinophils; the hemoglobin was 13.6 gm. The nonprotein nitrogen was 30 mg. per 100 cc., the chloride 106 milliequiv. per liter, and the total protein 6.5 gm. per 100 cc. The urine gave a + test for albumin, and the sediment contained 5 white cells and a rare coarsely granular cast per high-power field.

An x-ray film taken outside the hospital showed a pressure defect 3.5 cm. in length in the barium-filled esophagus; this defect was anteriorly placed at the level of the carina. The normal mucosal pattern could be traced through it, and no ulcer was apparent. The mass caused no great obstruction to the passage of barium. The stomach and duodenum appeared normal in form and function.

On the seventh hospital day an operation was performed.

*On leave of absence.

Differential Diagnosis

Dr. LeRoy A. Schall: The history of this case, although short, brings out several positive facts. First, there was severe substernal pain, which radiated to the right scapula, and then following the pain the patient had difficulty in swallowing. Whether this pain was due to obstruction or caused by eating is not brought out in the history. She had no difficulty with liquids. There was no apparent loss of weight on admission, nor had there been nausea or vomiting. There is no mention of regurgitation nor of belching, or of whether, if there was belching, this relieved the pain.

Dr. Benjamin Castleman: She had occasional regurgitation but no nausea or vomiting.

Dr. Schall: The pain was of long duration, at least several hours, and on one occasion it lasted all night. The patient noticed that lying down aggravated the pain. That is an important observation, but I should like to know whether swallowing while lying down caused pain.

From the history we have a story of pain followed by difficulty in swallowing. It would be well to consider what causes substernal pain and difficulty in swallowing. It has been estimated that at least 3 or 4 per cent of patients seeing a cardiologist because of substernal pain have pain due to disease of the gastrointestinal tract. In one series, a fifth of these gastrointestinal cases were due to disease of the esophagus. Could this be esophagospasm or cardiospasm? In these conditions, in contradistinction to angina, the pain is not related to effort. Atropine is beneficial. The pain in esophagospasm is of long duration, and x-ray examination demonstrates a dilated esophagus. When this dilated esophagus fills the patient may complain of a heavy substernal sensation and there may be regurgitation of food, which may be interpreted as vomiting; there may also be cough due to spilling over into the larynx. Pain and difficulty in swallowing may be due to congestion of the esophagus. In this condition the pain occurs in the recumbent position, and along with it there is difficulty in swallowing. Pain and difficulty in swallowing can be due to carcinoma of the esophagus, but in this condition the difficulty in swallowing usually comes first; there is a gradual closing of the esophagus due to the new growth, and the pain develops late. In this patient's history pain came first and then difficulty in swallowing. There was no cachexia, so that she probably had not had difficulty in swallowing over a long period of time. Esophageal hiatus hernia, that is, a hernia through the esophageal opening of the diaphragm, is usually painless, but it may start with pain, particularly if it is associated with an ulcer of the lower end of the esophagus or of the stomach. Difficulty in swallowing in esophageal hiatus hernia is not frequent but it may be present. In peptic ulcer of the esophagus the pain develops early and the difficulty in swallowing comes later. The pain is substernal, and it may be referred to the epigastrium. It may also be referred to the dorsal spine, and occasionally it is widespread. Rarely the pain is referred to the ear, the face and the neck. Cases have also been described of esophageal ulcer with pain referred to the shoulder, arm and hand, but in contradistinction to anginal pain, the pain is present over the radial surface of the hand. The pain in esophageal ulcer is precipitated by swallowing and is worse in the recumbent position, because these ulcers are usually low in the esophagus and regurgitation of gastric secretion precipitates the pain. Diverticulum of the esophagus is usually without pain, but there is a sensation of pressure. It fills up, and then it may cause difficulty in swallowing merely by the filled pouch pressing on the esophagus. A traction diverticulum is usually discovered on routine x-ray examination. The patient rarely has symptoms, and there is often a history of mediastinal tuberculosis or tuberculosis of the spine.

Figure 1.

Then we come to the x-ray interpretation. From the history as it is given, although it is stated that x-ray examination showed no apparent ulcer, I am inclined to think that this was an esophageal ulcer.

Dr. Milford D. Schulz: Ulcers of the esophagus are not always found.

Dr. Schall: I know it. I am basing my diagnosis on the symptoms.

Dr. Schulz: Here is the critical area, and the films taken in this hospital show the lesion described

(Fig. 1). The only further comment that might be made is that there does not seem to be much swelling of the mucosa as it passes from the defect, nor does there seem to be rigidity of the wall — it is quite flexible. This large film quite well rules out a hiatus hernia.

DR. SCHALL: The x-ray films demonstrate that there is a normal esophageal wall. There is no infiltration of the wall, but there is an extrinsic mass. In this view here, the right and left main-stem bronchi are patent and there is no broadening of the carina. Therefore, from the x-ray films one can say that this patient had a mass involving the esophageal wall, and that brings up the possibility of a benign new growth of the esophagus. There is no mention in the history of the Hinton test.

DR. CASTLEMAN: It was negative.

DR. SCHALL: Gummas of the esophagus are rare. A sister had died of tuberculosis. I assume that there was no evidence of pulmonary tuberculosis in this patient. I do not believe that this was a tuberculoma. I am inclined to think that this was a benign tumor of the esophageal wall, perhaps a tumor arising from the muscle — a leiomyoma.

DR. S. A. THEODORE: Could this have been a fibroma originating in the mediastinum?

DR. CASTLEMAN: That is a possibility. We have also seen intramural neurofibromas of the esophagus.

DR. HELEN PITTMAN: Perhaps it is one of the intramural extramucosal tumors of the esophagus that Dr. Schatzki used to talk about.*

CLINICAL DIAGNOSIS

Carcinoma of esophagus?

DR. SCHALL'S DIAGNOSIS

Benign tumor of esophageal wall (leiomyoma?).

ANATOMICAL DIAGNOSIS

Tuberculosis of mediastinal lymph nodes.

PATHOLOGICAL DISCUSSION

DR. CASTLEMAN: Dr. Richard Sweet operated on this patient. He had a great deal of difficulty exposing the lesion because of dense fibrous adhesions over the lung. When he separated these, he found a calcified focus on the pleura, which he thought was due to old tuberculosis. When he pushed the lung aside and got to the region of the esophagus, it was obvious that the mass was composed of an aggregation of enlarged lymph nodes that was pressing on the esophagus. He was able to remove them without entering the esophagus. At the operation a frozen section of one of the lymph nodes showed active tuberculosis. The nodes were removed to free up the obstruction, but nothing further was attempted. The patient is doing well.

The sections showed microscopically the characteristic caseation and Langhans giant cells of active tuberculosis. There apparently was no active tuberculosis in the lungs.

*Schatzki, R., and Hawes, L. E. Roentgenological appearance of extramucosal tumors of the esophagus. *Am. J. Roentgenol.* 48:1-15, 1942.

CASE 31342

PRESENTATION OF CASE

A five-day-old girl was admitted to the hospital because of vomiting since birth.

The infant was delivered with low forceps at term after a prolonged first stage of labor that lasted three days. The birth weight was 6 pounds, 2 ounces. She appeared normal at birth but began to vomit green material during the first night and continued to vomit at frequent intervals until admission. She passed normal meconium twice; then the stools became blue gray, and shortly before admission they became yellow. During the three days before admission the abdomen was markedly distended. She voided at least twice a day. The formula, which could not be retained, was supplemented by small subcutaneous clyses. Barium was given by mouth in the maternity hospital, but no abnormality was observed.

Physical examination revealed a slightly jaundiced, moderately dehydrated infant with a lusty cry, weighing 5 pounds, 12 ounces. The cranial sutures were over-riding, and the fontanelles were sunken. The abdomen was markedly distended, and peristalsis was practically absent. The cord was normal. The heart and lungs were normal. She vomited fecal material and passed by rectum small amounts of fluid with tiny particles of solid yellow stool.

The temperature was normal, the pulse 140, and the respirations 19.

Examination of the blood showed a red-cell count of 4,200,000, with 13.2 gm. of hemoglobin. The cells and platelets appeared normal. The white-cell count was 6600, with 20 per cent neutrophils, 68 per cent lymphocytes and 12 per cent monocytes. The urine was normal. The blood was Rh negative.

An x-ray examination showed the abdomen to be distended. There appeared to be free air scattered throughout the peritoneal cavity. There were numerous small areas of calcification. There was opaque material in the stomach and in one loop of bowel.

The infant was promptly started on measures of hydration preparatory to operation, but she died before operation could be performed.

DIFFERENTIAL DIAGNOSIS

DR. ALLAN M. BUTLER: We have an infant who began to vomit green material during the first day of life and continued to vomit at frequent intervals until admission, which, unfortunately, was not until five days later.

Vomiting of a newborn infant in the first twenty-four hours of life is extremely rare. When it does occur, it suggests that the baby is seriously sick and deserves careful examination to find the cause. Certainly a flat plate of the abdomen should have been taken. One should also resort to the test introduced by Dr. Sidney Farber,[1] — I blush to discuss this case with Dr. Farber in the audience, — which consists of examining the meconium to see if it contains cornified epithelial cells that the baby had ingested with the amniotic fluid. The presence of such cells in the meconium indicates that the intestinal tract is patent. If there are no such cells, the evidence is quite good that there is obstruction.

The baby's "stools became blue gray." Ladd and Gross[2] describe the stools in intestinal atresia as gray green. Throughout this history there is no indication whether the stools, which are mentioned at least twice, were small starvation stools, or whether they were large and contained milk curd. That information would be helpful to have.

Barium was given by mouth in the maternity hospital in an attempt to decide whether or not intestinal obstruction was present. In a newborn infant one does not have to resort to giving barium by mouth, and usually it is undesirable to do so. Certainly barium by mouth should not be given before a flat film of the abdomen is taken, and every effort should be made to make the diagnosis without giving barium.

Physical examination revealed a dehydrated youngster. Peristalsis was practically absent. As the child vomited fecal material, the intestinal obstruction would appear to have been fairly low.

Dr. Benjamin Castleman: The record states that the baby vomited questionable fecal and bile-stained material. The stools were small and fecal.

Dr. Butler: Then we are not so sure.

The next thing of note is the x-ray examination. I am sure that the films were taken immediately on admission to the hospital. There are two things of particular interest to look for in such patients: whether there is air in the peritoneal cavity and whether there are small areas of calcification. I wonder if we could see the x-ray films.

Dr. Milford D. Schulz: You can see the barium in the stomach remaining from the examination done prior to admission to this hospital. The stomach is outlined by air, but if that air were free in the peritoneal cavity I believe that it would extend up over the liver; in other words, what is seen is probably air in the tremendously dilated loops of bowel. In the right lower quadrant is a large collection of barium that is obviously in a large dilated viscus. Here are tiny collections of opaque material plastered over the edge of the liver, along the peritoneal surface. They do not look like barium.

Dr. Butler: I was going to ask whether the areas of calcification appeared to be barium or the calcification that is seen in meconium peritonitis.

Dr. Schulz: I should suspect the latter; if barium can get out of the bowel, air ought to be able to get out, and then if barium goes to the liver, air should also go there.

Dr. Butler: So the x-ray films certainly confirm what is obvious from the story: namely, this patient had intestinal obstruction. Whether it was partial or complete remains to be seen. Furthermore, the x-ray studies suggest that this child had meconium peritonitis. It is too bad we do not have more information about the stools, both regarding the presence of cornified epithelial cells and the appearance of milk curds.

One might ask whether the intestinal obstruction was due to a congenital anomaly with atresia, to a congenital anomaly with stenosis or to meconium ileus. Dr. Farber[3] has clearly described the obstruction due to meconium ileus and has correlated its occurrence with pancreatic achylia. Whatever the final picture, there was atresia of the bowel with obstruction. Whether it was congenital stenosis of the bowel with meconium or barium impacted above the obstruction or whether it was meconium ileus with pancreatic achylia does not at the moment affect the initial therapeutic procedure, which, of course, is operation. There are three things about the operation. First, the infant should have been operated on before the fifth day. Secondly, if atresia or stenosis is found, primary incision of that area and anastomosis, not enterostomy, is the procedure of choice, the reason being that in young infants atresia is frequently quite high in the gut and, if enterostomy is performed, one has a difficult time controlling nutrition and hydration. The third point concerns the use of pancreatic enzymes to dissolve the meconium, if at operation one finds meconium ileus on the basis of pancreatic achylia; in such cases there is an extremely tenacious meconium. I shall leave that aspect of the discussion to Dr. Farber.

My diagnosis in this case is intestinal obstruction, probably due either to stenosis or to atresia, aggravated by impaction of meconium and probably by some of the barium that was given and with meconium peritonitis and death before operation could be carried out.

Clinical Diagnosis

Meconium peritonitis.

Dr. Butler's Diagnoses

Intestinal obstruction due to congenital stenosis or atresia.
Meconium peritonitis.

Anatomical Diagnoses

Small intestinal obstruction (jejunal), due to congenital diaphragm.
Meconium peritonitis.

Pathological Discussion

Dr. Castleman: It is unfortunate that this child was not brought into the hospital sooner and operated on, because at autopsy we found a lesion that surgically could have been removed, with probable cure of the patient. About 30 cm. below the ligament of Treitz was a marked narrowing. The jejunum and duodenum above the obstruction were 5 cm. in diameter; then the jejunum narrowed down to about 1 cm. in diameter. At that point there was a diaphragm, in the center of which was an opening about 1 mm. in diameter; the bowel beyond it was collapsed. This obviously was a congenital abnormality, which, during fetal life, had produced obstruction and a rupture somewhere above it. We were unable to find the point of perforation at autopsy, and this is almost the rule in these cases. We found numerous areas of calcification, practically all limited to the surface of the right lobe of the liver. We could not find any on the surface of the intestines, either grossly or microscopically, so that the perforation probably occurred in the duodenum close to the right lobe of the liver.

Microscopically the diaphragm was made up of connective tissue, with mucosa on each side and no muscle layer. The capsule of the liver was markedly thickened, and in it were the areas of calcification that were seen on the x-ray films. Surrounding some of them were cornified epithelial cells, and in one section there was a suggestion of true bone formation.

Dr. Sidney Farber: I should like to express my agreement with Dr. Butler's conclusions and also with Dr. Castleman's opinion that this process may go on to bone formation. When the site of perforation can be demonstrated, it is usually found about 10 cm. proximal to the point of obstruction.

Dr. Butler mentioned meconium ileus. There are two kinds. One type is caused by inspissated meconium produced by partial obstruction, such as that caused by stenosis at the ileocecal valve. Dehydration accounts for the inspissation. The pancreatic enzymes are normal. The second type or true meconium ileus is caused by failure of the pancreatic enzymes to enter the duodenum. The most frequent cause is atresia or stenosis of the pancreatic ducts. The abnormal meconium in such patients is so thick and mucilaginous that normal passage through the intestinal tract is impossible. Fatal intestinal obstruction within two or three days after birth is an invariable result of such obstruction. The abnormal meconium in patients with pancreatic achylia and true meconium ileus may be put into a watery condition in a test tube quite readily when mixed with a 1 per cent solution of pancreatin. In several cases Dr. Robert Gross has been able to relieve the intestinal obstruction in babies with true meconium ileus by instilling into the small intestine such a solution of pancreatin. Complete relief of the intestinal obstruction took place, although intercurrent infection caused death days to weeks after the obstruction had been relieved. This method of therapy should be productive of successful results.

Dr. Butler: Ladd and Gross[4] give an excellent summary of the embryonic origin of diaphragms, persistence of which leads to partial rather than complete obstruction. In their book is a picture of a diaphragm that is identical with the one noted here.

Dr. Castleman: Dr. Schulz, is not this x-ray appearance pathognomonic of meconium peritonitis?

Dr. Schulz: I do not know anything else that causes areas of calcification over the surface of the peritoneum.

Dr. Castleman: Neuhauser,[5] at the Children's Hospital, has reported 3 cases with exactly this appearance.

References

1. Farber, S. Congenital atresia of alimentary tract: diagnosis by microscopic examination of meconium. *J. A. M. A.* **100**:1753, 1933.
2. Ladd, W. E., and Gross, R. E. *Abdominal Surgery of Infancy and Childhood.* 455 pp. Philadelphia: W. B. Saunders Company, 1941.
3. Farber, S. Relation of pancreatic achylia to meconium ileus. *J. Pediat.* **24**:387-392, 1944.
4. Ladd and Gross.[2] P. 26.
5. Neuhauser, E. B. D. Roentgen diagnosis of fetal meconium peritonitis. *Am. J. Roentgenol.* **51**:421-425, 1944.

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THE 1945 LEGISLATURE

July 25 brought to a close another chapter in the legislative history of the Commonwealth. In many respects this session of the General Court was an unusual one — extraordinary because of its length and even more extraordinary, from the physician's point of view, because of the time and attention that it gave to subjects pertaining to medical practice.

Many controversial subjects were discussed by this legislative body; none, however, were more so than those that concerned the laws regarding the practice of medicine in the Commonwealth. Reason had a hard time with emotion. Many times, confusion of the Legislature seemed to be the object aimed at. So innumerable were the red herrings drawn across the trail, that the trail itself was often obscured. The opposition set its stage skillfully, probably too much so, for as the lawyers put it, the case appeared to be "overtried."

It is gratifying that the major assaults on the Medical Practice Act were repulsed. These ranged all the way from further postponement of the effective date of the Approving Authority to its elimination. Furthermore, an attempt was made to set up a separate board of chiropractic, presided over by chiropractors, who would pass on the qualifications of those who would practice chiropractic in this state. Although this bill made no direct attack on the Medical Practice Act, it actually constituted a greater threat than all the other bills put together. In 1915, the Supreme Court of Massachusetts, in the case of *Commonwealth* v. *J. O. Zimmerman*, declared that the practice of chiropractic was the practice of medicine. The passage of this bill would have established a double standard for such practice and would have opened the way for innumerable healing cults to seek like concessions.

These bills were heard for the most part by either the Committee on Public Health or the Committee on Education, the former bearing most of the burden. The Honorable Joseph F. Montminy, senator from Lowell, presided over the Committee on Public Health with patience and good sense. The several bills having to do with the Approving Authority were finally consolidated by the committee itself into Bill 1980, which specifically exempted Middlesex University School of Medicine from the jurisdiction of the Approving Authority until July, 1949. This was reported favorably by the committee, Senator Montminy and Representatives Cutler, Vaughan and Harrington dissenting. This bill was voted on by the House on June 5, and by a vote of 148 to 74 was referred to the next General Court.

In the light of this action by the Legislature, it is difficult to understand why, on July 9, the House passed the Chiropractic Bill by a vote of 104 to 72. Subsequently the Senate concurred.

Curiously enough, it was not the House or the Senate that bore the brunt of the criticism that followed the passage of the Chiropractic Bill. Such criticism, and there was a good deal of it, was largely

directed toward the medical profession. An editorial in one of the newspapers stated that the physicians were less active, resourceful and persuasive than their opponents and that they did not make their strength felt fully, either as individuals or as a group. If this criticism is true, and there seems to be some justification for it, something surely should be done. Although there are certain explanations for this state of affairs, more true today than ever before because of the war, there can be no really legitimate excuse. The physician has sound knowledge in matters of this kind. Individually and as a group, he must make himself heard and understood, particularly when the public welfare is at stake. This is a definite obligation.

The Chiropractic Bill remained in Governor Tobin's hands until July 20, when he returned it to the House with his veto attached. The following quotation from the Governor's veto message shows how clearly he understood the implications of this proposed law: "It would establish new and different standards of education and qualification for applicants seeking to practice in a field in which minimum standards are already established by statute. Thus it would introduce into the statutory system a double standard for the selection of practitioners in the field of medicine." It is to be hoped that when the Committee on Legislation submits its final report of the year, it will read into the record the Governor's veto message in its entirety.

For what was accomplished, due tribute should be paid to the Committee on Legislation of the Massachusetts Medical Society,—particularly to its tireless chairman, Dr. William E. Browne, — and to other members of the Society who gave generously of their time. The committee deserves well of the Society, and what is still more important, it deserves well of the public at large.

CAVE CANEM

The past prevalence of canine rabies, which flourished almost as a democratic institution in this commonwealth until recent years, led to the adoption of certain standard practices. Chief among these is the rule that any person bitten by an unidentified dog that escapes later detection must receive antirabic treatment. The more there are of unidentifiable dogs that roam our streets and byways, the oftener will it become necessary to invoke this rule of safety.

The incidence of dog rabies in Massachusetts, according to information furnished by the Commissioner of Public Health, has shown consistent improvement during the past dozen years, dropping from 331 cases in 1934 to 58 in 1938, to 20 in 1942, to 5 in 1943 and to 1 in 1944, with none, to date, in 1945. The last case of human rabies occurred in 1935. The reason for this fall in incidence of dog rabies is not certain: it may have resulted from the preventive measures that have been adopted or it may simply reflect the natural rhythm in the rise and fall of the disease.

The history of rabies control in Massachusetts is of interest. Prior to 1934, it was attempted by area quarantine, but since the power of action is vested in the local communities and since there are over three hundred and fifty such political entities in the Commonwealth, concerted and co-operative action was never possible. In 1934 and subsequently, communities have been encouraged to organize dog-inoculation clinics, and perhaps because of the volume of such inoculations, it has been since 1934 that the decline in the disease rate has taken place. The present recommendation of the Department of Public Health is that communities in which cases of dog rabies have occurred, as well as contiguous communities, shall pass orders that no dogs be allowed on the streets, except on leash, unless they have been inoculated with antirabic vaccine within the previous year.

A considerable increase in the number of dogs untagged, uncollared and apparently unlicensed that are wandering in the streets of various municipalities of the Commonwealth has been noted. The stray dog is a potential health hazard, and in recognition of this fact the Commonwealth has for some time had a law requiring that all dogs be licensed, and each community employs, under normal conditions, dog officers whose duty it is to apprehend, seize and dispose of unlicensed members of the canine family.

Dog rabies may never again become prevalent in this country, but if there is any circumstance that will favor its spread and make human antirabic treatments necessary it will be that of allowing unidentifiable dogs on the streets, and if there is any circumstance that will form a basis for control it will be the registration of all respectable canines, together with the disposal of all others.

MEDICOLEGAL ABSTRACT

Liability for Malpractice: X-ray treatment of pilonidal cyst; liability of an x-ray assistant. Two recent New Jersey decisions arose out of the same situation. The patient brought separate suits against Dr. S. and Dr. C. for alleged malpractice.

The jury found against Dr. S. The patient introduced testimony having to do with x-ray therapy by witnesses who were licensed physicians but who did not hold themselves out as specialists in that branch of the profession. The court held that "having qualified as medical doctors, they [the physicians] are competent to testify on all medical subjects upon which they claim sufficient ability to express an opinion," so that the defendant could not exclude such testimony but only attempt to disclose by cross-examination that the witnesses did not possess sufficient knowledge.

The court held that the failure of Dr. S.'s treatment might be evidence of his negligence. The trial judge had refused to charge that "the mere fact that treatment given in any case does not result satisfactorily or beneficially to the patient is not evidence of negligence." In sustaining the trial judge the court said:

> The fact of nonbeneficial result may or may not be evidence of negligence. If, despite proper diagnosis and treatment, no benefit resulted, no negligence could be charged, but if the treatment failed because of failure to exercise reasonable diligence, knowledge or skill, the result may be evidential of negligence.

The court, however, quoted with approval an earlier New Jersey decision as follows:

> The physician, in attending his patients, engages that he will use due care to discover the nature of the disease which gives occasion for his services, and in applying the usual remedies; but beyond this measure of skill and diligence the law makes no exaction. If he is to be held for results, or as a guarantor of success, it can be only in virtue of his express agreement.

The basis of the jury's verdict against Dr. S. was apparently either that he had given x-ray treatments for a condition that he had correctly diagnosed as a pilonidal cyst or that he had erroneously diagnosed as a furunculosis and that an excessive dosage of x-ray had been given.

The trial judge decided in favor of Dr. C. without letting the case against him go to the jury, and the court sustained the trial judge. Under the court's view of the case the question was whether, on the evidence introduced by the patient, the jury could reasonably conclude that Dr. C. and Dr. S. were associates and engaged in a joint enterprise, so that each would be liable, and on that view the case is an interesting one on the existence of such a relation.

The patient's testimony was that he made an appointment to meet Dr. S. at his office and had never seen or heard of Dr. C. until he met him at Dr. S's office. Dr. S. examined him with Dr. C. present but merely looking on. Dr. S. diagnosed the case and prescribed the quantity and frequency of x-ray treatment and administered all the six treatments given except the third and fourth. In the third and fourth Dr. C. handled the application to and removal from the patient's back of the machine. Arrangements concerning the amount of fees were made by the patient with Dr. S., and all bills for services were payable to Dr. S., made out on his billheads and paid by the patient to him or his secretary. There was no testimony that Dr. C. received any part of the fees paid by the patient to Dr. S., or any proof of any advertisement that Dr. C. and Dr. S. held themselves out as associates, or any proof that Dr. C. in any way undertook to direct the treatment to be given the patient. Dr. C. merely continued the same treatment that had been prescribed and given by Dr. S. The court held from these facts that it could not reasonably be concluded that Dr. S. and Dr. C. were associates and engaged in a joint enterprise in the care of the patient.

The language of the decision is guarded and leaves room for the possibility that if the question had been properly raised the evidence might have been sufficient to show a relation between Dr. C. and the patient by reason of which Dr. C. would have been liable for any negligence of his own.—(*Young* v. *Stevens*, 132 New Jersey Law 124, 39 *Atl.* 2d 115 [1944]; *Young* v. *Crescente*, 132 New Jersey Law 223, 39 *Atl.* 2nd 449 [1944].)

BOOKS RECEIVED

The receipt of the following books is acknowledged, and this listing must be regarded as a sufficient return for the courtesy of the sender. Books that appear to be of particular interest will be reviewed as space permits. Additional information in regard to all listed books will be gladly furnished on request.

The Scholar and the Future of the Research Library: A problem and its solution. By Fremont Rider, librarian, Wesleyan University Library. 8°, cloth, 236 pp. New York: Hadham Press, 1944. $4.00.

This special work stresses the use of microfilm in library work.

Studies from The Rockefeller Institute for Medical Research. Reprints. Volume 126. 8°, paper, 574 pp., illustrated. New York: The Rockefeller Institute for Medical Research, 1944. $2.00.

The Chemistry and Pharmacy of Vegetable Drugs. By Noel L. Allport, F.I.C., research chemist, British Drug Houses, Limited. 8°, cloth, 252 pp., illustrated. Brooklyn: Chemical Publishing Company, Incorporated, 1944. $4.75.

This elementary treatise on the vegetable drugs should be of service to students of pharmacy and pharmacists. The pictures of the raw plant material are particularly interesting. An extensive index is appended to the text.

Atlas of the Blood in Children. By Kenneth D. Blackfan, M.D.; and Louis K. Diamond, M.D., assistant professor of pediatrics, Harvard Medical School, and visiting physician and hematologist, Infants' and Children's Hospitals, Boston. With illustrations by C. Merrill Leister, M.D., associate pediatrician, St. Luke's Hospital, Bethlehem, and Allentown General Hospital, Allentown, Pennsylvania. 4°, cloth, 320 pp., with 70 plates and 19 charts. New York: The Commonwealth Fund, 1944. $12.00.

This atlas contains seventy illustrations in color of blood cells seen in normal and in pathologic states in infancy and in childhood. It is based on the blood changes observed in more than five thousand infants and children at the Hematology Laboratory at the Infants' and Children's Hospitals, Boston, since 1927. This vast experience with diseases of the blood in children has been condensed in this unique atlas. Since practically all the diseases affecting the blood in adults also occur in children, the work should be useful to the general practitioner, as well as to the pediatrician. The color plates are excellent, the text is well printed, and a selected bibliography is appended to the text. The work is recommended for all medical libraries.

Pastoral Work and Personal Counseling. By Russell L. Dicks. 12°, cloth, 230 pp. New York: The Macmillan Company, 1944. $2.00.

Mr. Dicks is an authority on pastoral counseling and in this new work has covered the whole field in its many and varying aspects and especially in relation to other professions. There is much of medical interest throughout the text, especially in those chapters having to deal with pastoral calls on the sick, those contemplating marriage and war neurotics. The last chapter considers the relations of the clergyman and other professional workers, such as the physician, the nurse and the social worker.

The Avitaminoses: The chemical, clinical and pathological aspects of the vitamin deficiency diseases. By Walter H. Eddy, Ph.D.; and Gilbert Dalldorf, M.D., pathologist of the Grasslands and Northern Westchester hospitals, Westchester County, New York. Third edition. 8°, cloth, 438 pp., with 38 tables, 46 figures and 47 plates. Baltimore: Williams and Wilkins Company, 1944. $4.50.

The first edition of this authoritative text was published in 1937, followed by a second edition of 1941, and the authors now find it necessary to publish a third edition. The text has been rearranged to sharpen the separation between the deficiency diseases and the chemical nature and functions of the vitamins. The book is divided into three parts: the vitamins, treating of their nature and their function; the avitaminoses, in which the deficiencies of the various vitamins are considered; and technical methods, vitamin assay and vitamin values. The chapters on the chemical nature of the vitamins and cellular oxidation have been rewritten, and much new material has been added, including many illustrations.

The Story of a Hospital: The Neurological Institute of New York, 1909–1938. By Charles A. Elsberg, M.D., 12°, cloth, 174 pp., with 34 illustrations. New York: Harper and Brothers, 1944. $3.50.

Dr. Elsberg has written interestingly of the founding of the Neurological Institute in New York and of all its developments to the year 1938. The author has been associated with the institution from its beginning, when the idea of an institution entirely devoted to the study and treatment of diseases of the nervous system was new in this country. At first, the hospital was housed in a building with small and poorly arranged accommodations for patients and little space for laboratories, but nevertheless considerable clinical research was done in these inadequate quarters. The new hospital building was first used in 1929, and in 1935 the Department of Child Neurology was founded. The tenth chapter enumerates the contributions of the Institute to progress in neurology. Appended to the text are lists of trustees from 1909 to 1938 and of physicians and surgeons for the same period. This small book constitutes an important contribution to the history of neurology in the United States.

The Abortion Problem: Proceedings of the conference held under the auspices of the National Committee on Maternal Health, Incorporated, at the New York Academy of Medicine, June 19 and 20, 1942. Howard C. Taylor, Jr., M.D., conference chairman. 8°, cloth, 182 pp. Baltimore: Williams and Wilkins Company, 1944. $2.50.

Abortion is a major problem in medicine, public health and sociology. At the conference, held in 1942, many authorities discussed the subject in its various aspects. The text is divided into four parts: the magnitude of the abortion problem, including the frequency of abortion and its effects on the general health of the individual; spontaneous abortion and its prevention; social, moral and economic causes; and control of the abortion problem. The legal aspects are considered in the last part. This valuable reference source should be in all medical, public-health, sociologic and legal libraries.

Lead Poisoning. By Abraham Cantarow, M.D., associate professor of medicine, Jefferson Medical College, assistant physician, Jefferson Hospital, and biochemist, Jefferson Hospital, Philadelphia; and Max Trumper, Ph.D., lieutenant commander H-V(S), U.S.N.R., Naval Medical Research Institute, Bethesda, Maryland, and consultant in industrial toxicology, Cynwyd, Pennsylvania. 8°, cloth, 264 pp., with 5 illustrations and 21 tables. Baltimore: Williams and Wilkins Company, 1944. $3.00.

Lead poisoning is probably one of the most important of the toxic hazards encountered in modern industry. Prior to World War II, about 750,000 tons of lead were annually produced and consumed in the United States, and in 1940 about 54 per cent of the industrial plants in fifteen states were handling lead or its compounds. The physiology, pathology and clinical manifestations of lead are considered at length. There are special chapters on lead in the blood, body fluids and excretions, procedures for the determination of lead and the normal intake of lead. There is also a short chapter on the occurrence of chronic lead poisoning in industry. An extensive, selective bibliography is appended to the text. This comprehensive reference text should be in all medical and public-health libraries, as well as on the shelves of industrial physicians.

The Etiology, Diagnosis and Treatment of Amebiasis. By Charles F. Craig, M.D. 8°, cloth, 332 pp., with 45 illustrations and 10 tables. Baltimore: Williams and Wilkins Company, 1944. $4.50.

Dr. Craig in this new book has tried to include all the important data accumulated during the period since the publication of his earlier work in 1934. The book is well printed on good paper, and a selected list of references follows the text.

The Eclipse of a Mind. By Alonzo Graves, M.D. 8°, cloth, 722 pp. New York: The Medical Journal Press, 1942. $5.00.

Autobiographies of sick persons, especially those afflicted with mental disorders, are of interest and value in the study of disease. This book records the life history of an extremely intelligent individual who throughout life had been afflicted with manic-depressive psychosis, having gone through eight attacks, five of which required complete hospitalization. Interspersed with the author's text are the hospital records of admission and discharge, and also comments of the various physicians having charge of the patient. A unique feature of the presentation is the placing, side by side, of hospital records of the patient's behavior and his explanations and elaboration of the same on recovery. The biography was written by the patient at the suggestion of the attending physician during the fourth hospitalization, and on the basis of the material obtained the evident gaps were filled in by replies to a series of questions. The patient recovered after

the fifth hospitalization and did not return for further treatment. The work is divided into three parts. The first deals with heredity and environment, marriage and consequences, and psychiatric interludes. Part two relates the story of seven attacks and four hospitalizations. The third part contains the author's reflections on his personality, including his sex life and his dream life, and his comments on mania and depression. The final chapter tells the story of the fifth hospitalization, the final attack before the patient's return to civil life. The story is written in a pleasing, narrative style and printed in good type on good paper. Such biographies are uncommon and should prove of exceptional value to psychiatrists and allied scientists and to human biologists. The book is recommended for medical libraries.

Interns Handbook: A guide, especially in emergencies, for the intern and the physician in general practice. Prepared by members of the faculty of the College of Medicine, Syracuse University, under the direction of the Publication Committee, M. S. Dooley, M.D., professor of pharmacology, and Maynard E. Holmes, M.D., professor of clinical medicine, co-chairmen. Third edition. 16°, cloth, 579 pp., with 15 tables and 15 figures. Philadelphia: J. B. Lippincott Company, 1944. $3.00.

This handy manual, first published in 1929 and appearing in a second edition in 1938, has been thoroughly revised and should prove useful as a handbook of ready reference. The sections on chemotherapy, endocrine disturbances and the vitamins have been entirely rewritten. The subjects of pulmonary emboli and the vitamins are included for the first time. The text is divided into three parts: medicine, surgery and therapy. The therapeutic part includes a long list of well known drugs, with their therapeutic indications.

Beloved Crusader, Lawrence F. Flick, Physician. By Ella M. E. Flick. 8°, cloth, 390 pp., illustrated. Philadelphia: Dorrance and Company, 1944. $3.50.

Dr. Flick was a pioneer in the campaign against tuberculosis in the United States. He was a strong individual and as a crusader in this field naturally made many enemies, as well as friends. He was instrumental in founding the White Haven Sanatorium and the Phipps Institute in Philadelphia. He was responsible for bringing the international conference on tuberculosis to the United States in 1908. He was also active in congresses in foreign countries. In 1907 he made a trip as a delegate to the fourteenth International Conference of Hygiene held in Berlin, and it was at that time that he succeeded in obtaining the international congress for Philadelphia, for which Mr. Henry Phipps guaranteed five thousand dollars for expenses. In 1909 Dr. Flick traveled to Europe to study tuberculosis, and his diary of this trip comprises a chapter in the book. Dr. Flick was greatly interested in history, and in 1884 he took a large part in organizing the American Catholic Historical Society of Philadelphia. This biography by his daughter is a worth-while contribution to the history of tuberculosis in the United States and the live factual story of a great man.

Sickness Indemnification. A panel discussion by R. A. Hohaus and others. Transactions Series, Bulletin No. 1. 55 pp. 8°, paper. Pittsburgh: Industrial Hygiene Foundation, 1944. Price on request.

This is a discussion on what is commonly known as health insurance. Three participating experts and the chairman dealt with the economic and administrative problems of group-health programs to employees and their families. Andrew T. Court discusses the economic basis of health, in which he compares occupational and nonoccupational disability, bringing out the fact that disability from occupational causes is low and is being reduced, whereas nonoccupational disability has shown no improvement. Various interesting charts show how the increase of income above budget needs does not seem to improve health; death-rate trends indicate improvement in health of moderate-income groups. Increase of income above budget needs increases medical care moderately but inflates medical expenses. Short waiting periods result in increased sick claims of long duration, and the nursing of minor indisposition does not reduce serious sickness. Dr. Gafafer discusses sickness indemnification and gives in detail the experience of sick-benefit organizations connected with two public utilities and two iron and steel companies. There is also given in detail the data concerning sick-benefit organizations of eleven member companies of the industrial hygiene foundations.

Putting the Disabled Veteran Back to Work, II. A further panel discussion by C. D. Selby, M.D., and others. Special Series, Bulletin No. 3. 33 pp. 8°, paper. Pittsburgh: Industrial Hygiene Foundation, 1944. Price on request.

This short pamphlet considers in order the following subjects: readjusting the veteran, vocational rehabilitation and placement of the veteran, new experiences in putting the disabled veteran back to work, and job-placement qualifications and guidance to disabled veterans returning to work. This timely pamphlet, as well as the preceding one, should prove useful to all physicians and others having to do with personnel in industry.

Fischerisms, Being a Sheaf of Sundry and Divers Utterances Culled from the Lectures of Martin H. Fischer, Professor of Physiology in the University of Cincinnati. By Ray Marr. Third and enlarged edition. 24°, cloth, 83 pp., with a frontispiece. Springfield, Illinois: Charles C Thomas, 1944. $1.80.

The aphorisms of Professor Martin H. Fischer, professor of physiology at the University of Cincinnati, were first published in 1930, and a later edition appeared in 1937. The third edition has been enlarged, by Ray Marr, by the addition of many new sayings added during the past seven years. The terse pithy statements collected in this volume were uttered by Professor Fischer during his lectures on physiology. They were collected mostly from the margins of the notebooks of students. This small volume is a welcomed addition to the collections of aphorisms of Osler and others. The volume is not for general circulation, having been privately printed for the students of Professor Fischer.

Personal Mental Hygiene. By Dom T. V. Moore, O.S.B., M.D., Ph.D., professor of psychology and psychiatry, Catholic University of America. 8°, cloth, 331 pp. New York: Grune and Stratton, 1944. $4.00.

This book is intended primarily for the individual, and because of this objective, the workings of the mind and its adjustments to life have been illustrated by an analysis not only of clinical material but also of various historical and literary personalities. The author points out the possibilities of ordinary emotional adjustment and at the same time brings into psychiatry the higher things of human life. It is an attempt to familiarize the individual with the possibility of emotional adjustment to the difficulties of life and also by a number of examples to provide a knowledge of wholesome attitudes of mind, ideas and principles.

The Marihuana Problem in the City of New York: Sociological, medical, psychological and pharmacological studies. By the Mayor's Committee on Marihuana. 8°, cloth, 220 pp., with 53 tables. Lancaster, Pennsylvania: The Jaques Cattell Press, 1944. $2.50.

This comprehensive study of a public-health problem was made by a special committee of the New York Academy of Medicine. All aspects of the drug are covered. A short, historical sketch of the growth and usage of the drug, including the pertinent facts concerning hashish, precedes the text.

NOTICES

SOCIETY MEETINGS AND CONFERENCES

Calendar of Boston District for the Week Beginning Thursday, August 30

Friday, August 31

*9:00–10:00 a.m. Medical clinic. Isolation Amphitheater, Children's Hospital.

10:50 a.m. Systemic Mycotic Infections. Dr. Bernard Appel. (Postgraduate clinic in dermatology and syphilology.) Amphitheater, Mallory Building. Boston City Hospital.

(*Notices continued on page xv*)

NOTICES (*Continued from page 264*)

TUESDAY, SEPTEMBER 4

*9:00–10:00 a.m. Medical clinic. Infant's Hospital.

*12:15–1:15 p.m. Clinicoroentgenological conference. Peter Bent Brigham Hospital.

WEDNESDAY, SEPTEMBER 5

*12:00 m. Clinicopathological conference. Children's Hospital.

*Open to the medical profession.

SEPTEMBER 13. The Hemorrhagic Diseases. Dr. William Dameshek. Pentucket Association of Physicians. 8:30 p.m. Haverhill.

SEPTEMBER 17. American Public Health Association. Page 572, issue of November 30.

OCTOBER 1–6. Medicolegal conference and seminar. Page 776, issue of June 28.

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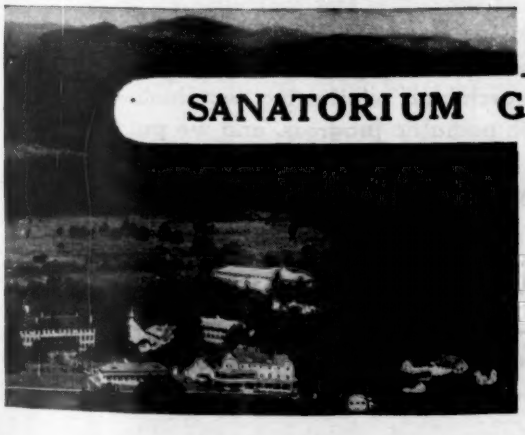

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